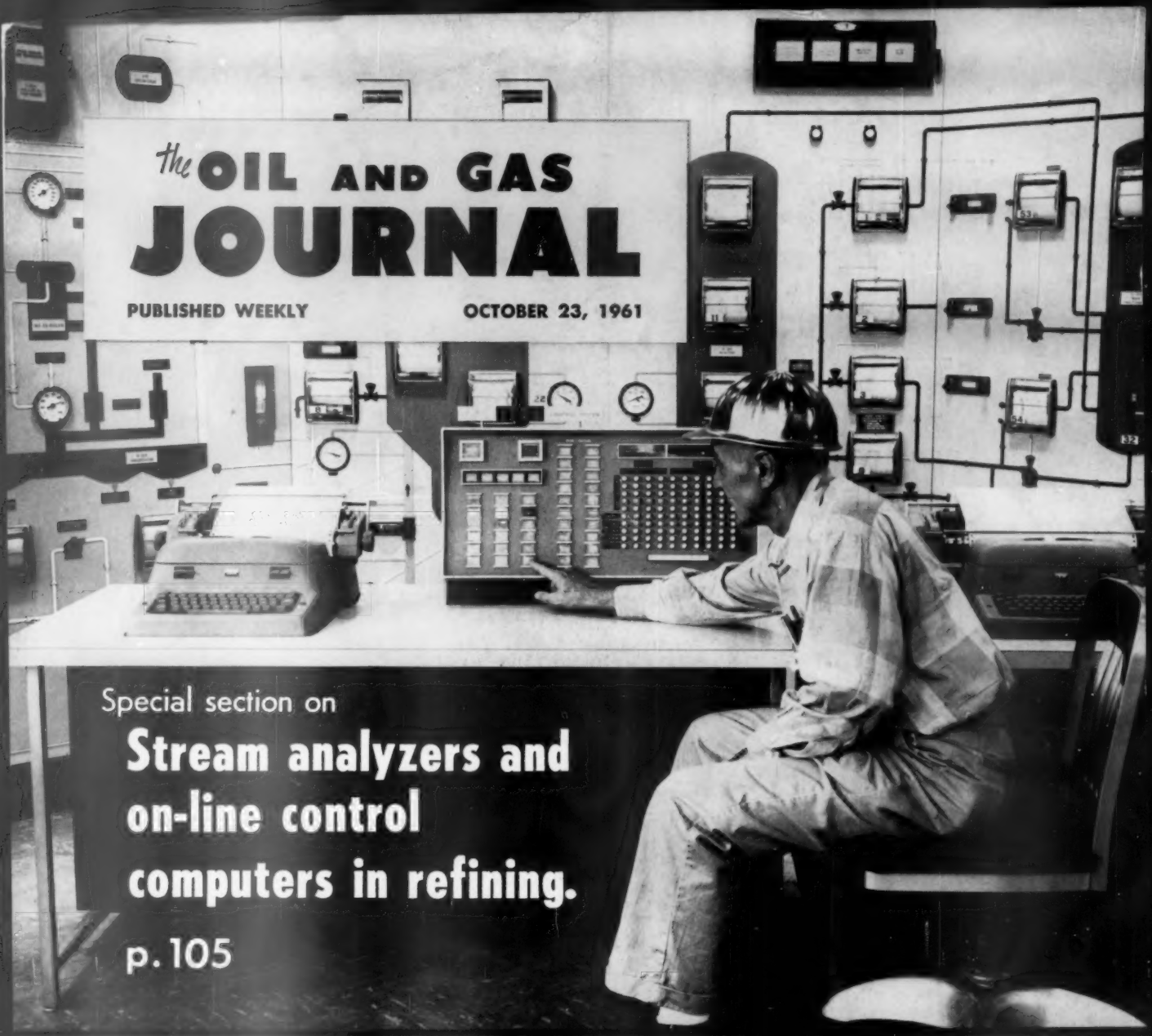
the OIL AND GAS JOURNAL

PUBLISHED WEEKLY OCTOBER 23, 1961



Special section on

Stream analyzers and on-line control computers in refining.

p. 105

ARTICLES

Central lube system for compressors saves $42,000 a year ▸ 128

Gas turbine scores in air drilling ▸ 131

Pipeline simulation program gives quick answers ▸ 138

How to form a unit fast ▸ 145

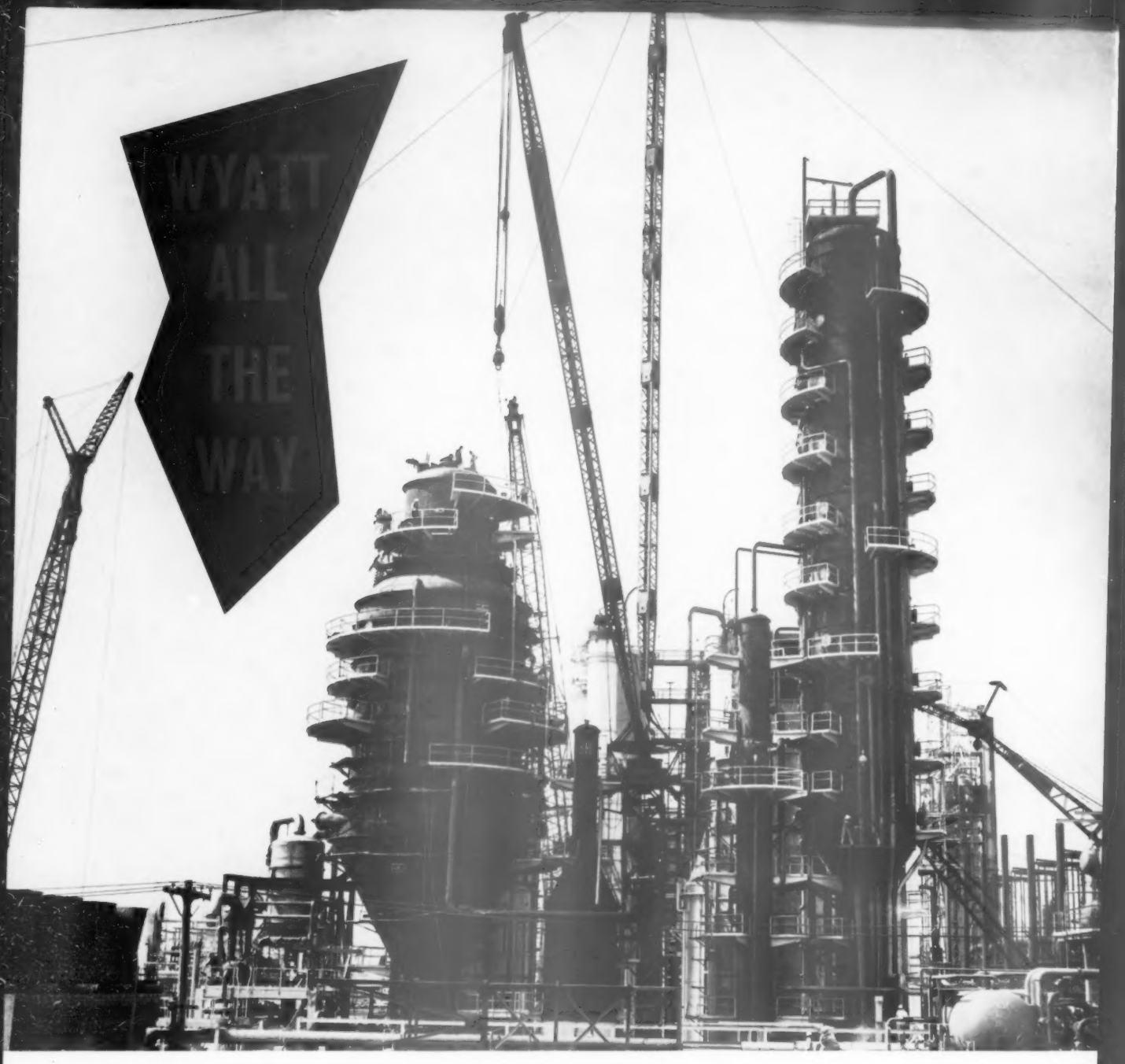
NEWS

How crude prices look now:
Most price inequities have been corrected, but ▸ 7

Soft fuel oil, Continent products markets may cause new cuts ▸ 75

FTC has give-take pricing ideas, too ▸ 78

Arab Oil Congress starts in low key ▸ 98



The equipment in the new crude distillation unit of Sinclair Refining Company, Houston, was furnished by Wyatt Industries, Inc., which fabricated and erected the vacuum tower, left, and the distillation tower, right. Two additional vessels in the foreground were shop fabricated and erected by Wyatt's.

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OIL AND GAS JOURNAL
Vol. 59, No. 43

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SPECIAL REPORT: Instrumentation and control in refining—2 105

By Gerald L. Farrar

The areas covered by this special project report are: (1) recent advances in continuous process-stream monitoring, and (2) the up-to-date picture on automation progress in refineries, as shown by the status on on-line computer-control process installations. Faster and more accurate analyses are keys to better control in refining. In conventional control the process may be maintained closer to the accepted criteria, and in on-line computer control the continuous analyzer provides means to continually reevaluate the process dynamics. Application of computer control on a wide basis seems inevitable. Installations, studies, and expressions of interest in computer control systems are increasing. Currently there are eight announced refinery installations of on-line digital computers.

Technology

Refining-Processing

The foreman's page 126

Distillation—Part 7, a quiz on elementary concepts.

Compressor central lube system saves money 128

By H. A. Anderson

A central lube system, providing precision supplies of lubricant for 10 steam-engine and gas-engine driven compressors, has saved Neches Butane Products Co. $210,000 in labor and material costs alone in 5 years of operation. Further, down time has been cut.

Processing notes 136

New Shell facilities aid refueling—Nalco becomes fourth TEL maker—Heaviest reactor goes up in Ohio refinery—First pseudocumene shipped from Texas.

Questions on technology 143

Contamination formulas for catalysts have limited usefulness.

Drilling

Gas turbine scores in air drilling 131

By Peter B. Bike

In the first commercial operation of a prototype gas turbine to deliver compressed air for air drilling, the turbine delivered up to 1,645 c.f.m. of air at pressures up to 165 psi. The well was drilled from just below the surface to total depth of 6,603 ft. Results: Excellent penetration, good hole cleaning, and superior cuttings recovery.

Pipelining

Simulation program recognizes all pertinent factors 138

By W. A. Zama

Here's a program which has simulated operation of several of Shell's main trunk lines to determine line capacities and operating pressures. It provides in seconds, answers to technical questions which would otherwise require days of manual calculation.

Production

How to unitize fast for water flooding 145

By A. M. Roney and Norman J. Rubash

Depletion-drive fields in the Denver basin should be put under water flood as soon after discovery as possible to avoid losses in ultimate recovery. All-out efforts of Pan American Petroleum Corp. in getting units formed quickly have been paying off in a big way.

THE OIL AND GAS JOURNAL **Newsletter**

October 23, 1961

Significant this week

Danger signs are still prominent features of the crude-price landscape.

Crude analysts have inscribed these warnings on two of the signs:

—Effects of any future cuts would be strong enough to trigger a downward movement eventually.

—Mid-Continent is the real trouble spot, since crude in that area is under pressure from lower prices in the Denver-Julesburg basin and from weak gasoline showings.

Price cutting has slowed, at least temporarily. But at this stage, no one knows what's ahead. There just aren't any textbook rules in crude pricing (p. 75).

Week of hearings on oil-import-control program will be held in Washington, starting November 20.

Democratic Rep. Tom Steed of Oklahoma, head of a House Small Business subcommittee, will preside. Subcommittee staff has already obtained questionnaire information from hundreds of oil and coal companies (p. 77).

A special report on refinery instrumentation and control is one of the highlights of this week's Journal.

Rundown on timely subject is the third in a continuing series. Area covered by report includes:

—Recent developments in continuous process-stream monitoring.

—A look at progress in refinery automation, as shown by status of in-line, computer-control-process installations.

Report also gives idea of what's coming in instrumentation and control (p. 105).

In the works: World's biggest helium plant, a billion-cubic-feet-yearly installation at Liberal, Kans.

Panhandle Eastern Pipe Line and National Distillers and Chemical Corp. plan to have the facility on stream by mid-1964. Government would take all of the helium (p. 93).

Self-propelled core-drilling ship working off California has hung up a mark to shoot at: 1.7 holes a day during one 29-day period.

Ship's owner says aluminum pipe helped achieve fast drill-

ing of the 48 holes. So did new anchoring system (p. 90).

In other domestic news:

Most drilling contractors in West Texas-New Mexico area will raise wages for crews by mid-November. In some cases, it will be an "in effect" raise, obtained by dropping work week to 48 hours but leaving take-home pay intact (p. 84).

To no one's surprise, Texas Railroad Commission has fixed an 8-day crude allowable for November. It's the seventh consecutive 8-dayer (p. 77).

Track has been cleared for start on big water-flood project in northwestern New Mexico's Horseshoe Gallup field, with Atlantic Refining as operator (p. 80).

Hydrocracking discussion at California meeting has provided first report on Lomax unit which went on stream at Powerine Oil refinery last summmer (p. 82).

Making its bow in the gas-transmission business, Shell has joined Fish Engineering and Pan American in project for new gas pipeline from Oklahoma to St. Louis (p. 86).

Aurora crude-pipeline proposal goes before Canada's National Energy Board Thursday. Short but important Alberta line would connect with Continental in Montana (p. 90).

Canadian Petroleum Association expects this year's spending on oil and gas development in western Canada to beat the $622-million record set in 1957 (p. 79).

On the foreign scene:

IPC negotiators are still shaking their heads over stubborn attitude of Iraqi Government.

Collapse of oil talks with Premier Kassim leaves IPC in a "watch-and-wait" position. Two things look like safe bets: Private oil operations will be limited in future, and Iraqis will set up a national oil company (p. 96).

Third Arab Oil Congress opened in air of calm, but differences in viewpoints of member countries stirred speculation that flareup might occur before sessions ended (p. 98).

News in the making

November 15 is current target date for announcing new import-control program.

Interior proposals are now at White House and are being circulated to other departments: State, Defense, Justice, and Office of Emergency Planning (formerly OCDM).

Plan is still along lines indicated by Journal earlier: Substantial cut in crude-import totals, perhaps as much as 100,000 bbl. daily; some changes in mechanics of residual fuel control and in sliding-scale method of determining crude

quotas, but no abandonment of either; some form of "discouragement" of rate of increase of Canadian crude imports into Midwest; and a new presidential proclamation. But big impact will be the total crude reduction.

Also picked up on the Washington beat:

Rep. Frank Ikard will resign his House seat within a few days. Effective date—between mid-November and December 1--will be set after Texas congressman confers with Texas officials on best time for special election, which must be held within 60 days of vacancy.

FPC Chairman Joseph C. Swidler will speak at one of the general sessions of the API in Chicago.

Savings with LACT aren't what they should be.

Labor savings still help the credit side of ledger, but losses are occurring because of API gravity determination.

The trouble: Samples are taken and usually stored under same conditions that prevail when crude goes through LACT unit but sample analysis is made under different conditions. Shaking, pouring from one vessel to another, and exposure to atmospheric pressure reduce gravity by 1.5° or more.

At 2 cents or more per barrel per degree, losses on big lease can be severe. Losses are greater in summer because high temperatures speed evaporation. API's studying problem.

Look for some interesting developments on pipelining coal in heavy-fuel-oil slurry.

One such project's already well advanced in pilot testing. Big economic advantage: Slurry can be charged directly to blast furnaces without separation at receiving end.

Kansans predict dire results if crude price cut comes to their state.

Says one Wichita independent: "We hear rumors of a cut as high as 35 cents, and if it comes we may as well close our doors." Other independents say cut in price could reduce exploration by at least 50%.

Watch for spirited drilling campaigns this year and next in southeastern corner of Colorado.

Already in 1961, Baca County has seen one new oil field, three new gas fields, and 21 gas development wells. County's success ratio stands at 22% for wildcats, 60% for field wells. Kiowa County field work score: Five gas wells in seven tries.

Plymouth Oil's chairman, Walter S. Hallanan, confirms his company is still interested in selling out.

But the right offer hasn't been received from any of several companies which have discussed a possible deal. "Right" offer is believed to be around $100 million.

Market memo

Oct. 23, 1961

Look for **more governmental probing** into bonded vs. nonbonded bunker fuel prices in East Coast markets.

Several companies are now getting requests from Office of Emergency Planning, formerly OCDM, for data on quantities and prices from 1957 through first half of 1961. The OEP apparently wants to determine if current price spread of about 40 cents between them is a new development stemming from resid controls.

Long-standing requests for lifting control on the asphaltic content of imported crudes also is getting new attention. OEP is asking for new information from four companies which filed original petitions.

More government in your business. Justice Department in New York is investigating the difference between wholesale prices on Long Island, a chronic price-war area, and Manhattan. City officials charge Manhattan motorists are victims of discrimination . . . You'd better read what the **Government's No. 1 policeman** in gasoline pricing thinks about present marketing practices (p. 78). Just one of his ideas: Private brands are entitled to their customary 2-cent price differential.

In the product markets:

Distillates are marking time in all areas awaiting start of the heating season delayed by warmer than normal weather. Prices are reported firm in most areas except Chicago where discounting already has started.

Gasoline is still having its violent ups-and-downs. In the East, Norfolk and Buffalo are again battlegrounds with Norfolk now reporting a 5.4-cent dealer tankwagon price. In the Mid-Continent there's enough material going at 9.25 and 9.125 cents to make the 9.50-cent wholesale price shaky. And cargo gasoline prices on the gulf are under no pressure but still probably could be discounted one-fourth or three-eighths.

American Oil strategy in expanding into five western states and Texas apparently will be to build stations rather than buy existing outlets.

Two reasons: Good buys in the West have been pretty well picked over by Humble, Conoco, and Gulf. Also building stations won't bring antitrust action, always considered a threat when a major starts buying smaller firms in a new area.

Big question now is: When will Amoco get started.

Report from oil credit managers conference: DX Sunray's Breitweiser says credit expansion should be used as a tool to get new business instead of being considered a liability . . . Shell's Dugdale underscored importance of credit by revealing that 75 to 80% of his company's sales are on credit . . . One warning from Humble's Reams who says oil firms must prosecute credit-card fraud cases because criminals have put them down as easy marks.

Problem: What are they selling? A Los Angeles service station has a sign in front reading "Stop in and have your morning coffee with us."

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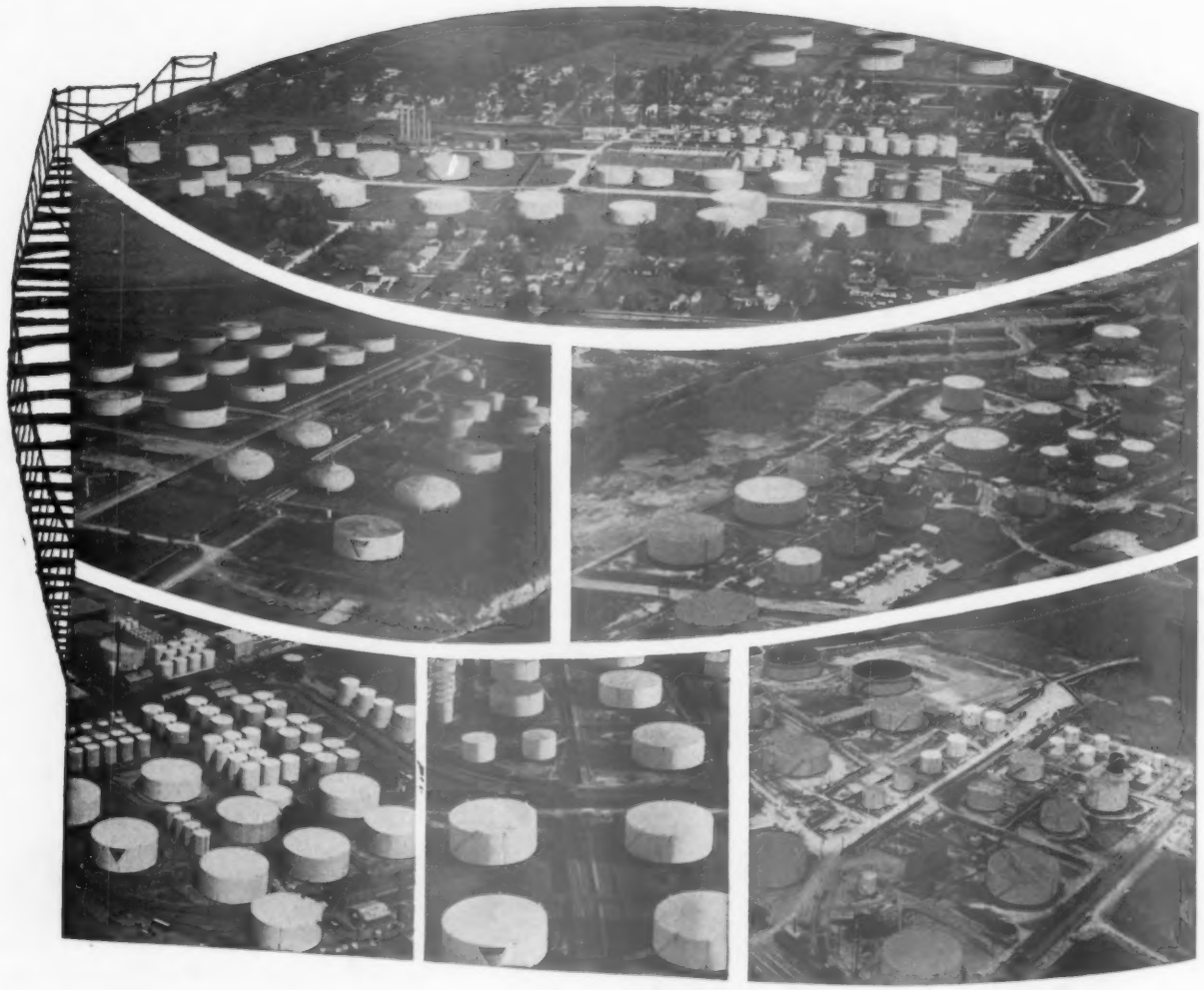

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For more facts, including experience of some of these gas companies, write Department NL-6, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

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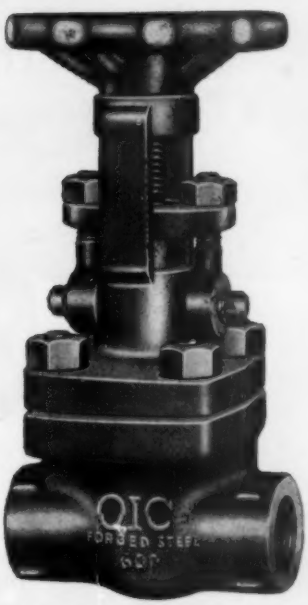

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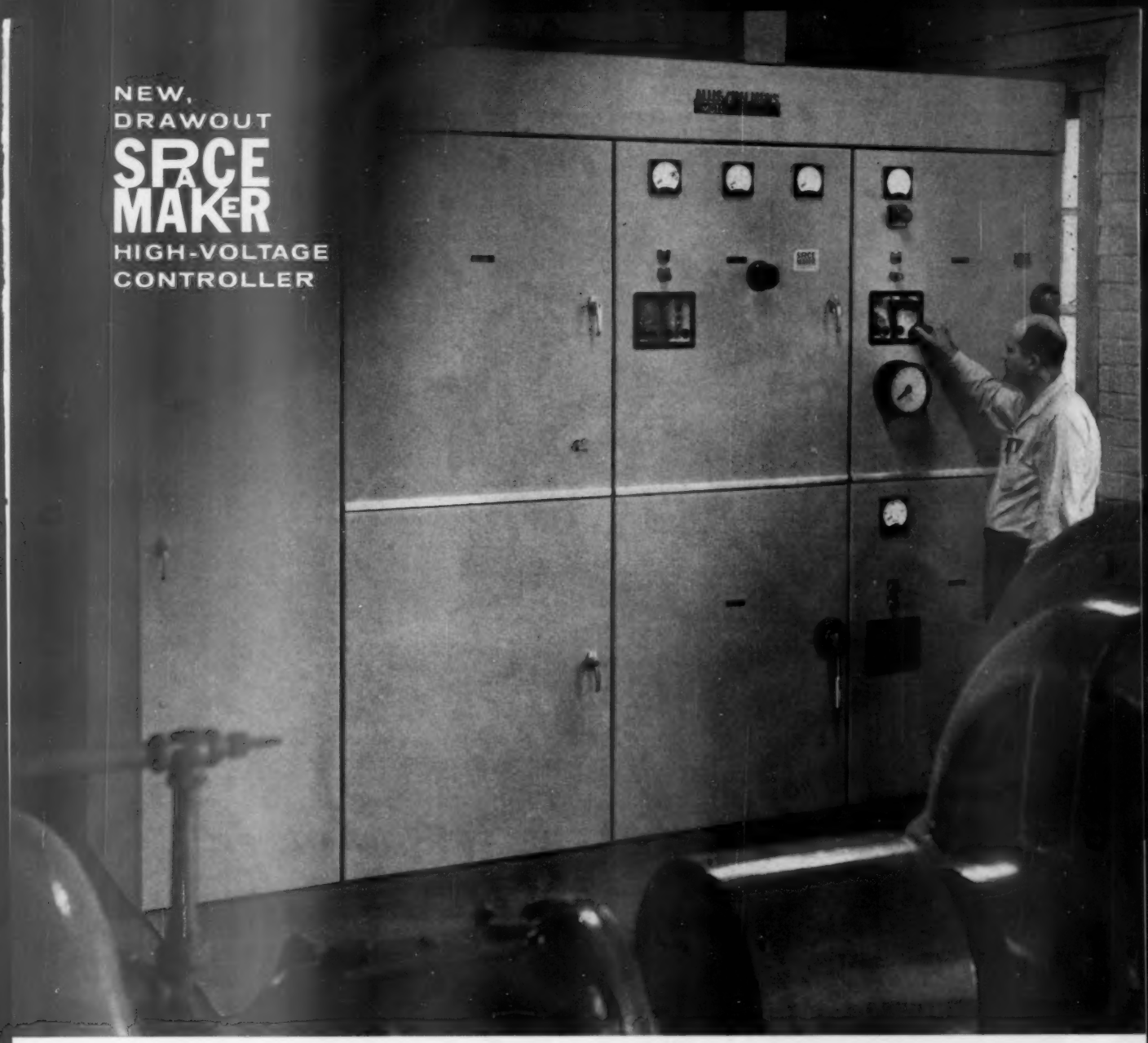

SPACEMAKER control at Stratman pumping station: (from left to right) 1. Auxiliary controls. 2. Fused disconnect switch (upper) and spare cubicle (lower). 3. Synchronous control. 4. Wound-rotor control (upper) and squirrel-cage control (lower).

New SpaceMaker control eliminates costly floor-rebuilding for St. Louis County Water Company

Privately owned St. Louis County Water Company serves more than 160,000 customers in a 225-square-mile area adjoining St. Louis, Mo. This progressive utility recently replaced an obsolete panelboard in a "cramped" pumping station with new *SpaceMaker* high-voltage motor control.

Allis-Chalmers new, exclusive two-high design enabled the utility to install all needed controllers in a single lineup. This permitted use of existing conduit without changes — thus saving cost of conduit relocation and floor reconstruction. Other controllers would have required a back-to-back layout.

Equally important: the single lineup of *completely* drawout front access controllers saved valuable aisle space.

To learn more about the *exclusive* cost-cutting, space-saving features of *SpaceMaker* control, contact your A-C representative or write **Allis-Chalmers,** Industrial Equipment Division, Milwaukee 1, Wis.

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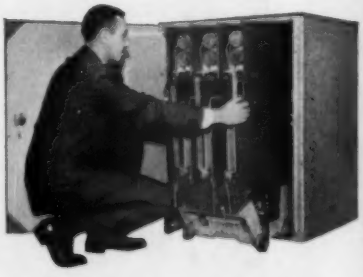

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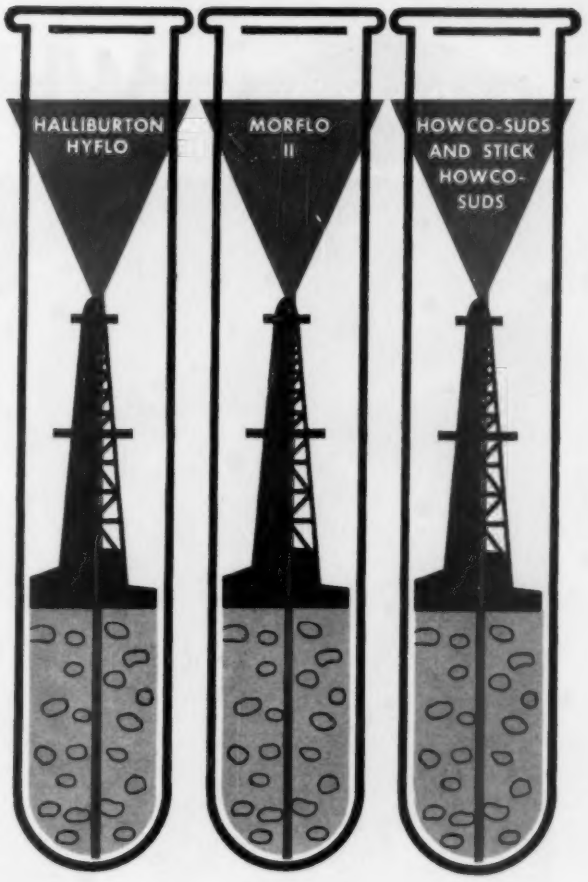

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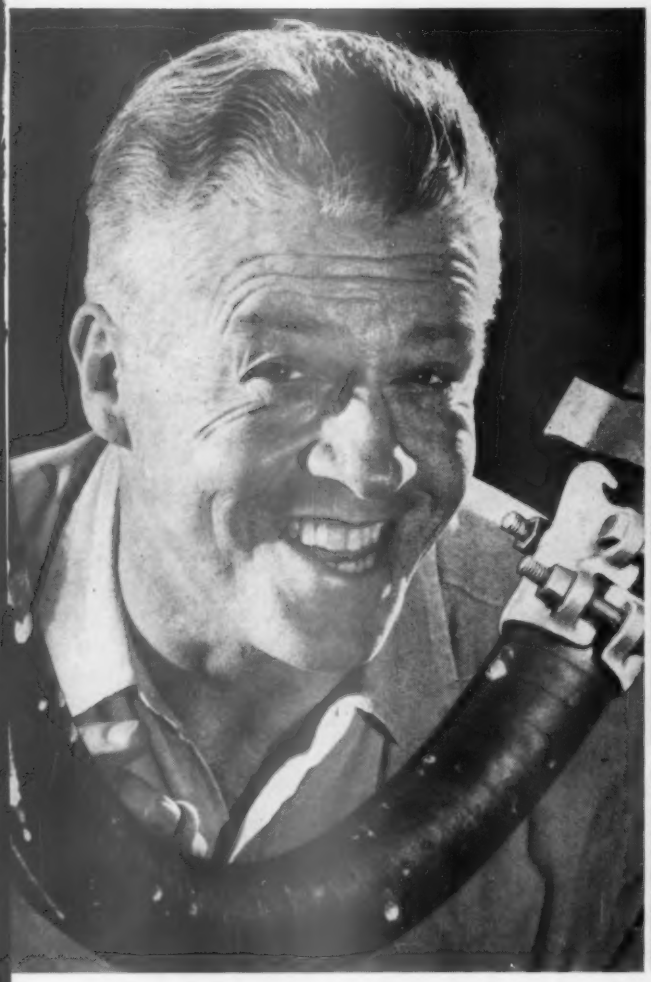

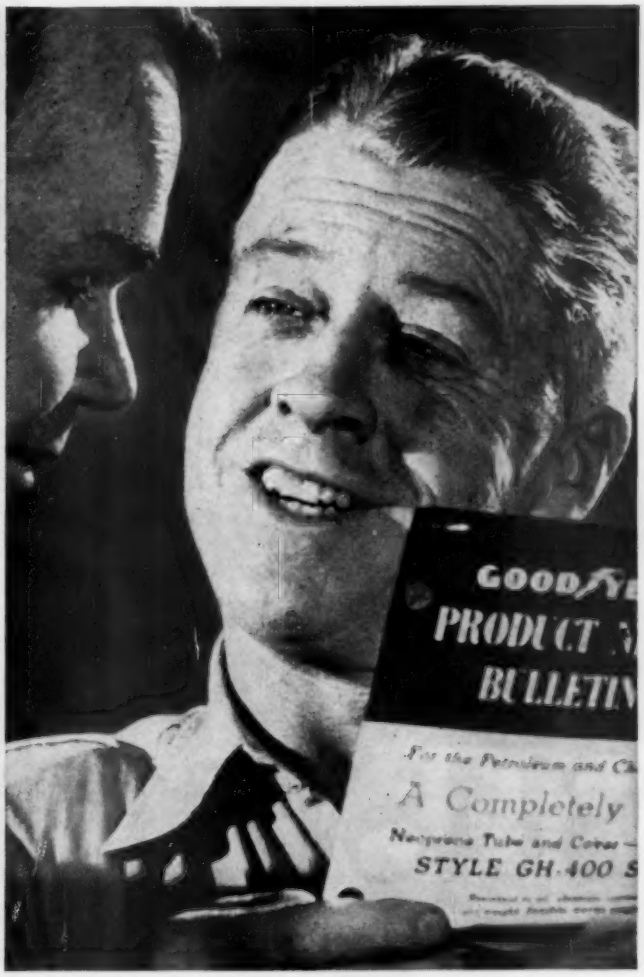

YOU GET UNMATCHED QUALITY
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YOU GET EXPERT ADVICE
(With a trained hose expert like the G.T.M. – Goodyear Technical Man – always on call, *it's easy with Goodyear!)*

the right time... at the right price... call with all industrial rubber products

Or write Goodyear, Industrial Products Division, Akron 16, Ohio

GOODYEAR INDUSTRIAL PRODUCTS

accuracy

ASHCROFT DURAGAUGES measure pressure with precise **accuracy** no matter how severe the conditions of service

Ashcroft Duragauges are available in pressure ranges from 15 psi (or vacuum) minimum to 100,000 psi. Dial sizes: 4½" through 12".

sustained

The Bourdon tube in Ashcroft Duragauges is manufactured to precision standards of flexibility and mono-linked to the rotary movement. When pressure flexes the tube, the gauge pointer is always positively positioned, because it is mounted on the geared center shaft of the movement. Sustained high accuracy and long life are assured.

Choose your Ashcroft Duragauges made of components best suited to your needs. Eight Bourdon tube materials are available. Movement of stainless steel with nylon bearings and pinion gear for longest wear. Case materials: special aluminum alloy or tough phenol plastic.

The unique "Maxisafe®" Duragauge provides absolute protection to the viewer, plus easy and quick access to the mechanism. Your industrial supply distributor will help you select the best combination of components for your Ashcroft Gauge requirements. Phone him today or write for Catalog 300B.

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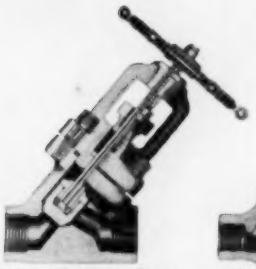
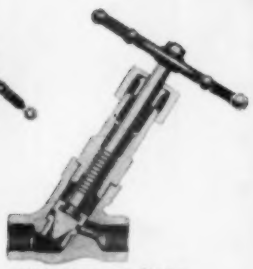
Edward Steel Globe Valves fit any oilfield or refinery piping plan

Edward forged steel globe and angle valves are perfectly designed for oilfield, petrochemical, and refinery applications. Ideal for air, water, oil, and other hydrocarbons, for steam, anhydrous ammonia and other gases . . . they resist corrosion, heat, high pressure, abrasion, and rough treatment from operators. They are available in sizes from ¼" to 2½", in both globe and angle designs, to suit any petroleum industry application. Edward globe valves feature straightway design for optimum flow, Impactor* handles for easy seating in high-pressure service, and other innovations developed in Edward's uniquely large research laboratories. Edward builds a complete line of forged and cast steel stop, check, and stop-check valves for process industries. For additional information, see your favorite distributor, or write to Edward Valves, Inc., 1212 West 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company. 6015



General Purpose Globe Valve
Fig. 848, Bolted Bonnet
2000 lb WOG
600 lb at 910F
(Sizes ¼" to 1")



High Pressure Globe Valve
Fig. 158, Screwed Bonnet
10,000 lb WOG
(Sizes ¼" to 2")

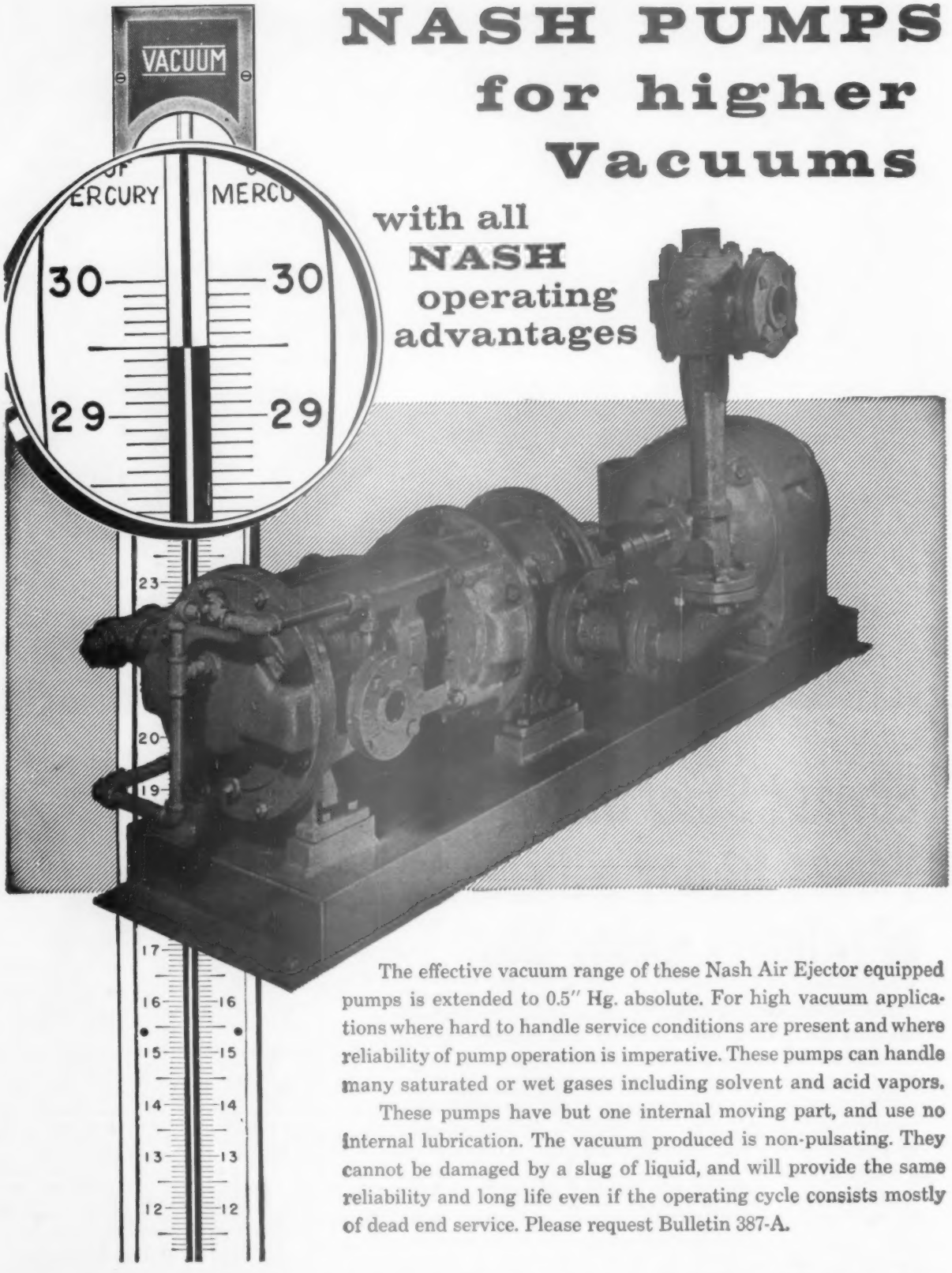
Fig. 848 features new spiral wound gasket, new solid disk of chrome-cobalt-tungsten alloy, integral Stellite seat, forged steel body and bonnet, exclusive EValloy 13% chromium stainless steel stem, and new swing-style stainless steel gland bolts. Also available in angle design. Fig. 158 features EValized bonnet to resist corrosion and abrasion, and protect stem threads; replaceable screwed-in seat and swivel needle disk of EValloy 13% chromium stainless steel, Impactor* handle, Buna-N "O" rings for leakproof joints. Both valve types are available in choice of screwed or socket welding ends.

*T.M. Reg. U.S. Pat. Off.

EDWARD STEEL VALVES
another fine product by
ROCKWELL

NASH PUMPS for higher Vacuums

with all **NASH** operating advantages

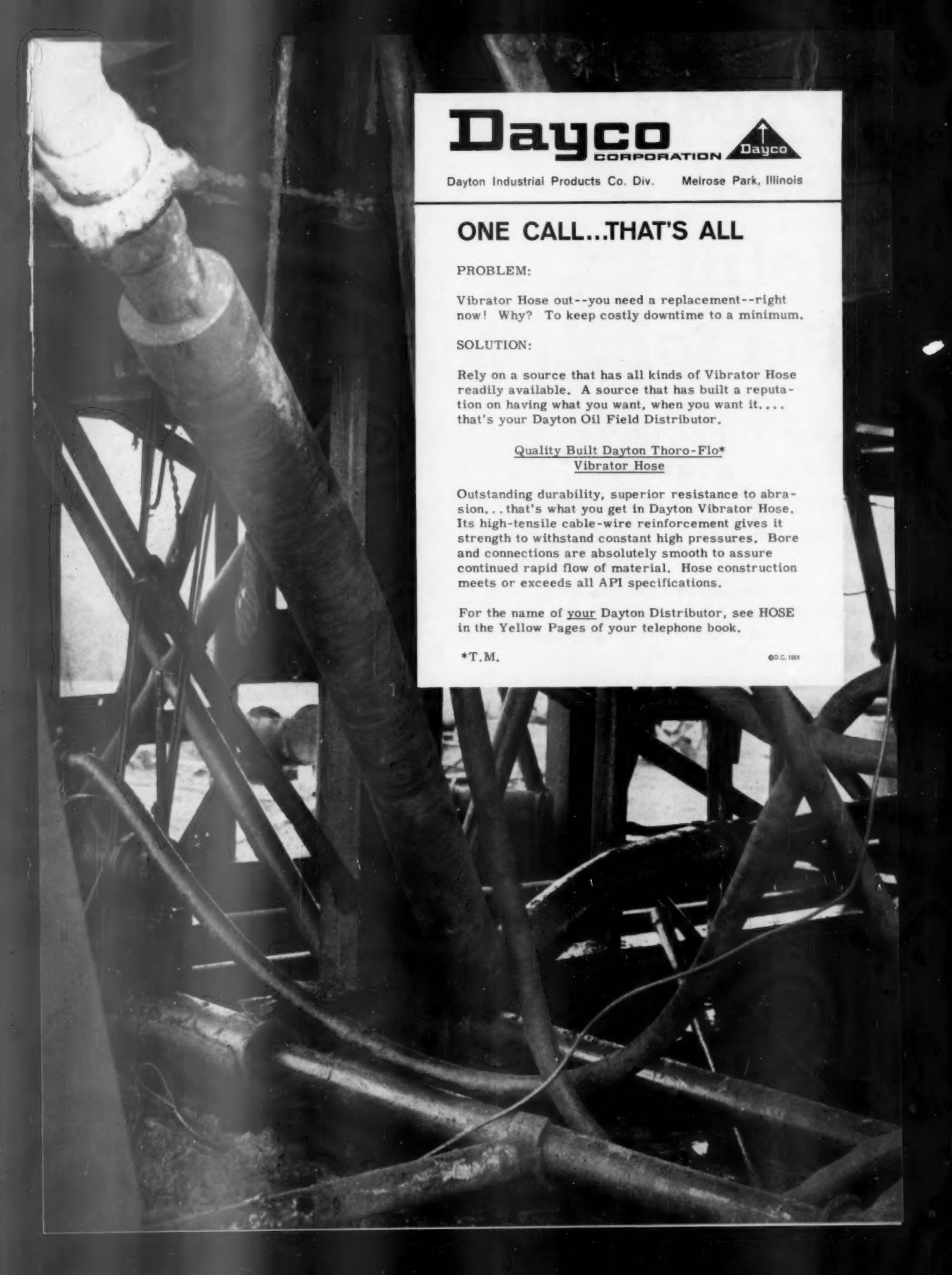


The effective vacuum range of these Nash Air Ejector equipped pumps is extended to 0.5" Hg. absolute. For high vacuum applications where hard to handle service conditions are present and where reliability of pump operation is imperative. These pumps can handle many saturated or wet gases including solvent and acid vapors.

These pumps have but one internal moving part, and use no internal lubrication. The vacuum produced is non-pulsating. They cannot be damaged by a slug of liquid, and will provide the same reliability and long life even if the operating cycle consists mostly of dead end service. Please request Bulletin 387-A.

NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.



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SOLUTION:

Rely on a source that has all kinds of Vibrator Hose readily available. A source that has built a reputation on having what you want, when you want it.... that's your Dayton Oil Field Distributor.

Quality Built Dayton Thoro-Flo*
Vibrator Hose

Outstanding durability, superior resistance to abrasion...that's what you get in Dayton Vibrator Hose. Its high-tensile cable-wire reinforcement gives it strength to withstand constant high pressures. Bore and connections are absolutely smooth to assure continued rapid flow of material. Hose construction meets or exceeds all API specifications.

For the name of your Dayton Distributor, see HOSE in the Yellow Pages of your telephone book.

*T.M.

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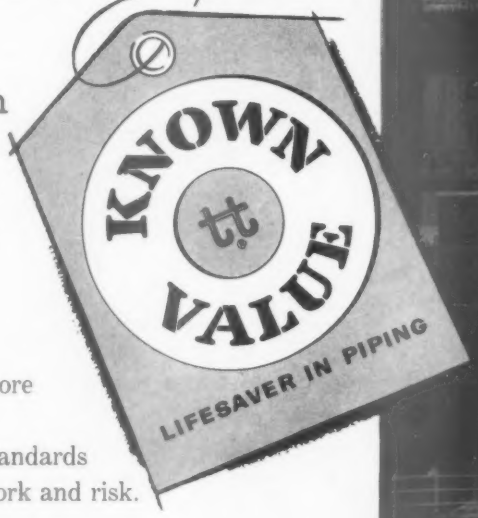
These Better Bellows Expansion Joints are Performance Rated



Every "TUBE-TURN" Bellows Expansion Joint rating certifies a definite cyclic life, ends the hazard of misleading "average" life warranties

Experienced piping engineers know it is risky to select bellows type expansion joints on "average" life warranties. They have often adopted more costly loop or offset pipe configurations just to be safe. This is no longer necessary. TUBE-TURN Bellows Expansion Joints have not only set new standards in design and performance, their certified cyclic life ratings end all guesswork and risk.

Everyone, piping designers, engineers and contractors, who have used TUBE-TURN performance-rated Bellows Expansion Joints *know* there is nothing like them on the market today. Be sure you have the facts on this new, better, lower-cost protection. Phone or write your nearest TUBE-TURN Bellows Expansion Joint specialists now. Also write us today for a copy of Bulletin TT 1035-K-218. TUBE TURNS, Louisville 1, Kentucky.

"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

For better, lower-cost protection, specify TUBE-TURN Bellows Expansion Joints.

Cyclic life tests prove TUBE-TURN Bellows Expansion Joints have an average life of four times the minimum assured life.

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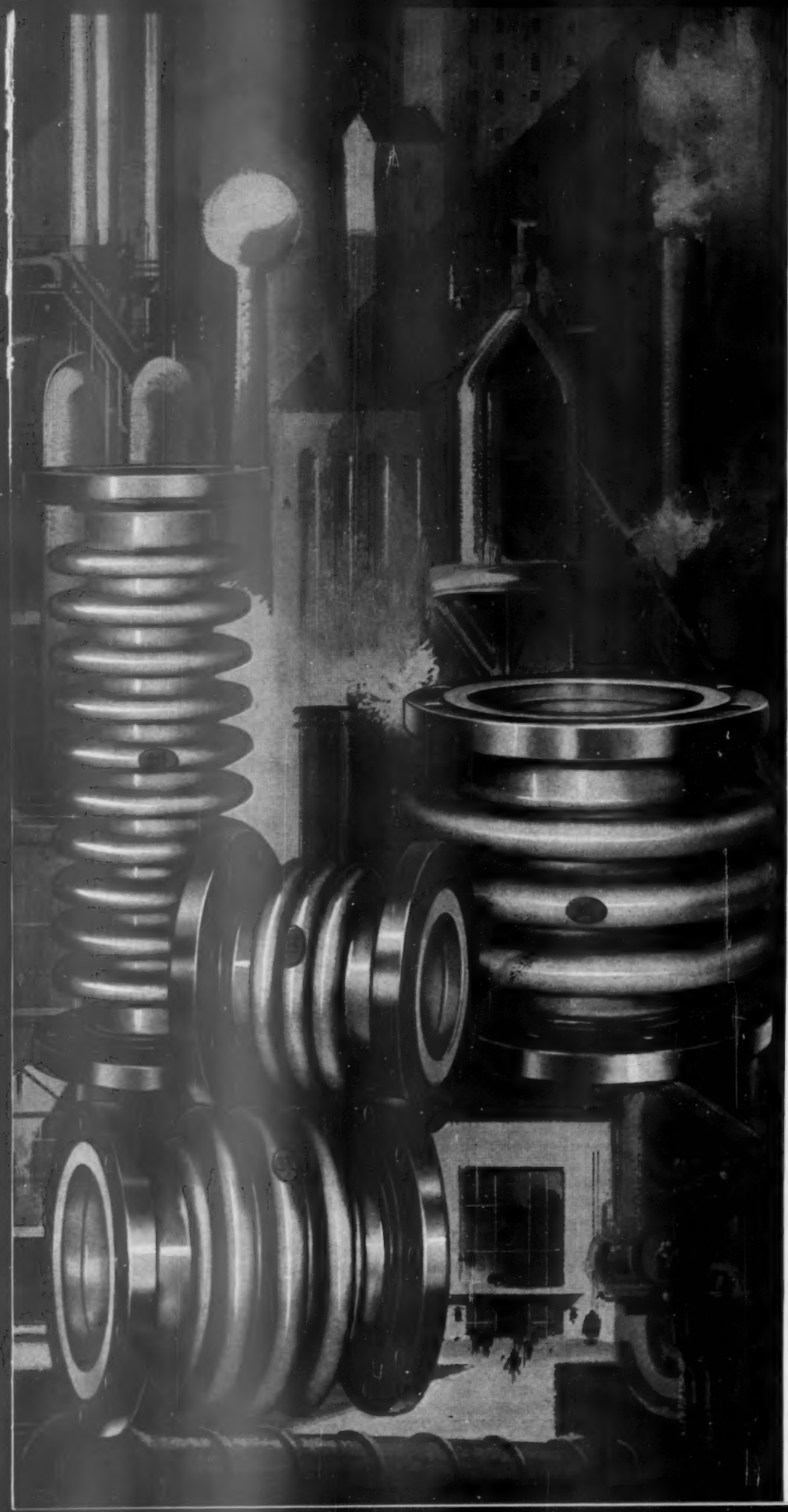

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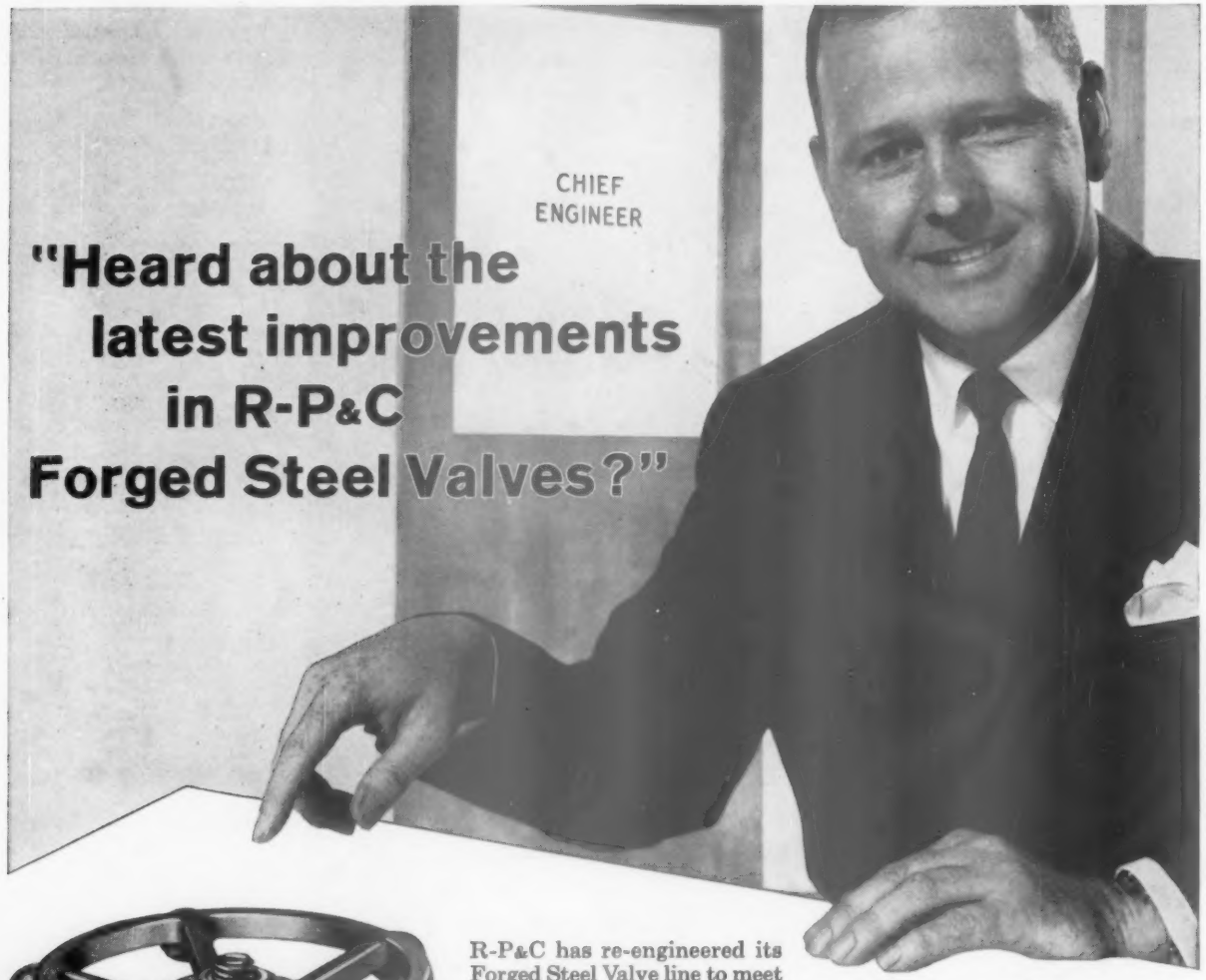
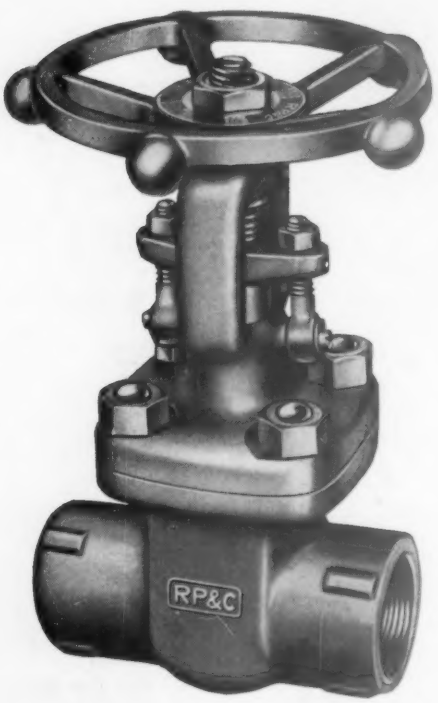


"Heard about the latest improvements in R-P&C Forged Steel Valves?"



R-P&C has re-engineered its Forged Steel Valve line to meet the highest standards of quality for the Refinery, Chemical, Power and Process industries. These valves incorporate the most up-to-date design and material improvements found in any forged steel valve! One example is the stuffing box—redesigned for 50% greater sealing efficiency. These improvements add up to longer, trouble-free valve service for you, with minimum maintenance.

Here are other R-P&C Forged Steel Valve improvements:

- **Stellite-faced seats, lapped to 2-3 micro-inch finish; results in a durable seal**
- **Redesigned body bonnet joint gives 25% increase in gasket sealing area**
- **"390 Brinell" stem with rolled threads for continuously smooth movement**
- **Moly-Disulphide lubricated oil grooves in operating nut give easiest operation**
- **1200°F premium packing—uniformly compressed and graphited—includes a proved inhibitor that prevents corrosive damage**
- **Thrust washer between handwheel and operating nut eliminates seizing and galling**

In addition to Forged Steel Gate and/or Globe Valves, R-P&C distributors offer users in all industries a complete line of R-P&C gate, globe and angle valves in all standard materials: iron, bronze, bar stock, cast steel—plus many specialties.

See your R-P&C distributor for full details and prompt service.

R-P&C VALVES

ACCO

R-P&C Valve Division, American Chain & Cable Company, Inc.

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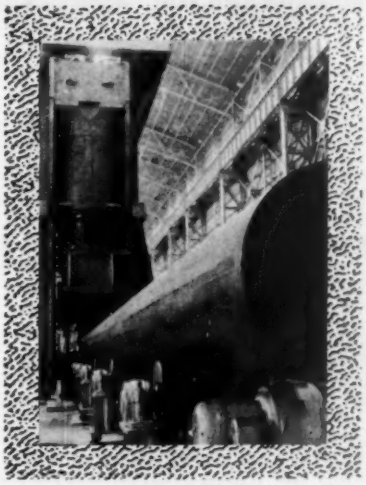
The highest quality line pipe is a major product of our completely integrated production line. Our High-Pressure Line Pipe is produced in accordance with API standard 5LX at NKK's new Large Diameter Welded Pipe Mills — the only installation of its kind in the Orient. It is a superb product of the U.O.E. Process. This high-yield strength pipe is made by the Automatic Submerged Arc-Welding and Hydraulic Cold-Expanding System . . . For a really superior line pipe you're invited to take advantage of NKK's 50 years of experience as Japan's leading steel maker. Write for details & catalogs.



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(Japan Steel & Tube Corporation)

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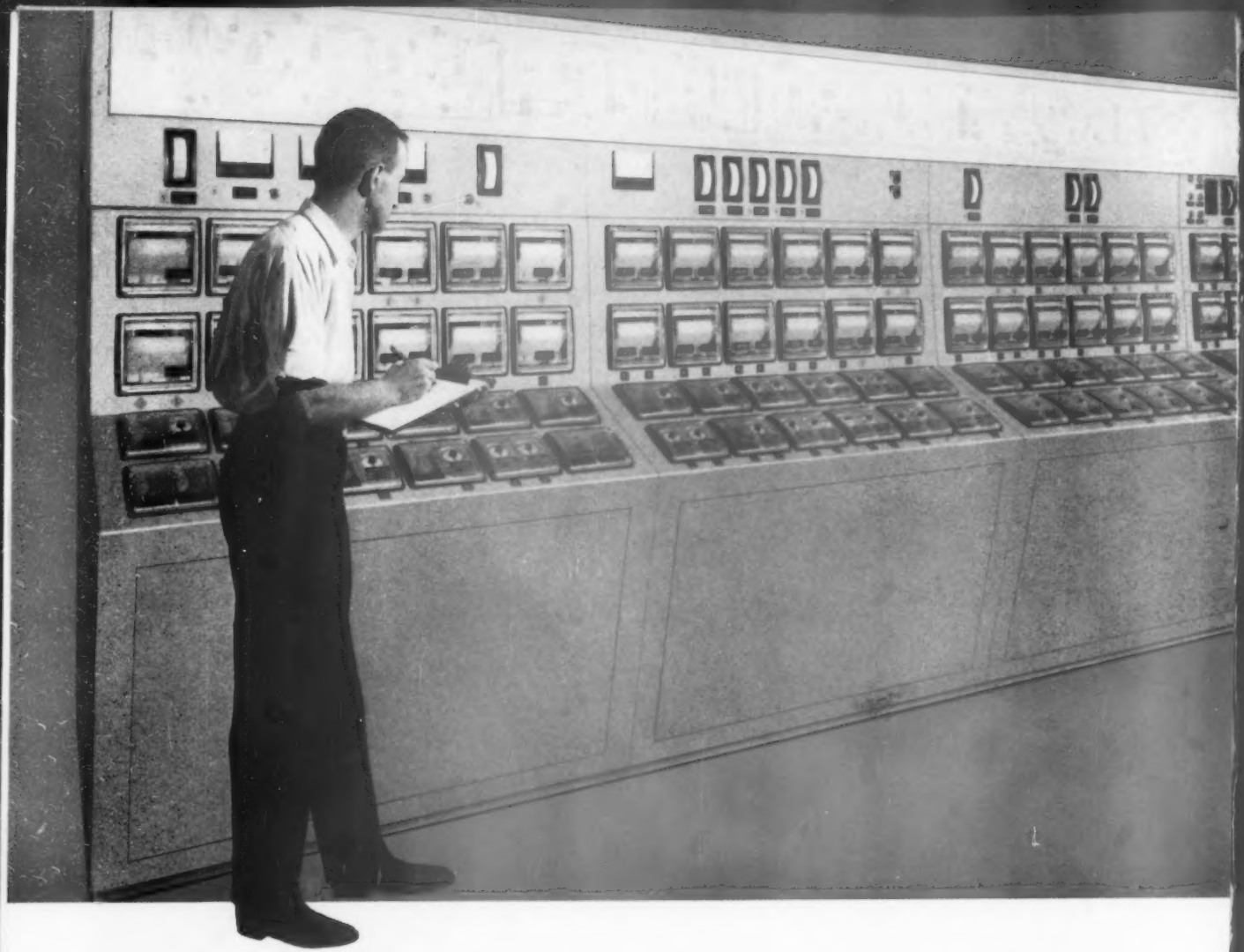
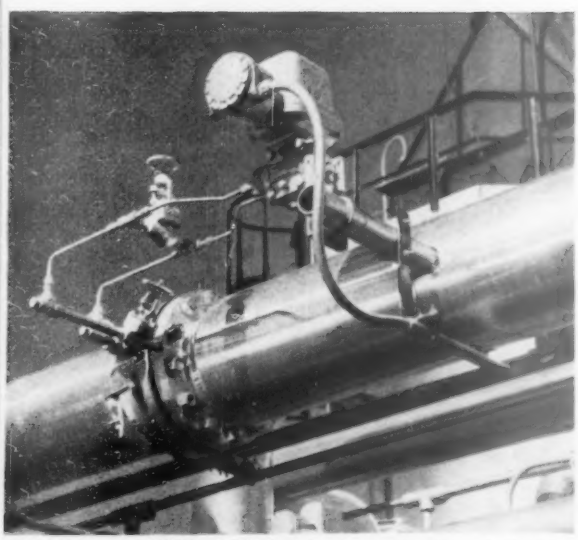


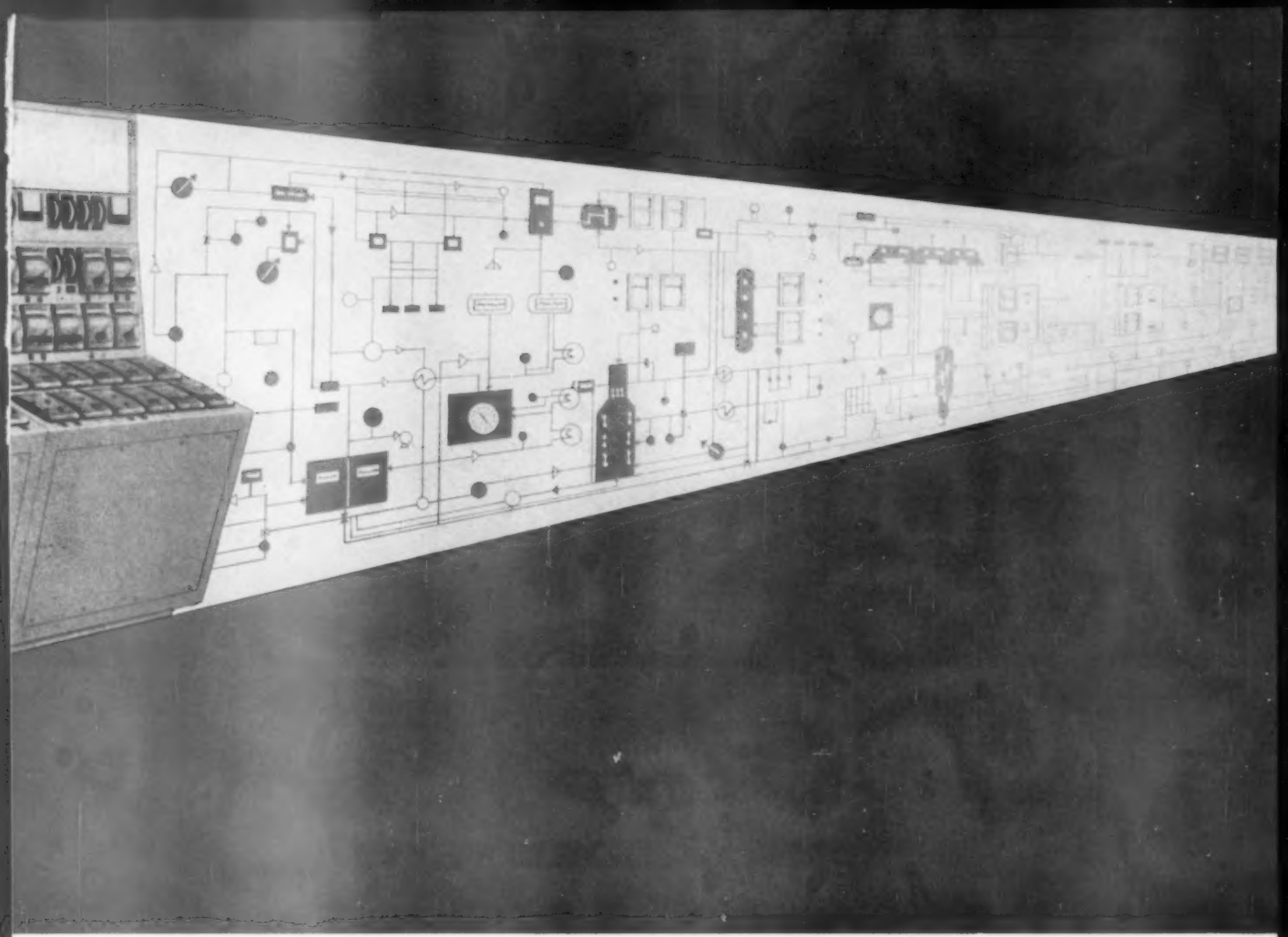
Foxboro Electronic Consotrols* shrink



100% solid state instruments, like this Foxboro Type 613 d/p Cell* Flow Transmitter, were used in all control loops to assure instant transmission over long distances. **Reg. U. S. Pat. Off.*

Fifteen-foot Foxboro Electronic Console permits fast scanning of instruments — gives dependable control of Alkar† unit, styrene plant, and steam plant for Cosden Petroleum.

†Trade mark Universal Oil Products Co. — Process Licensor
Badger Manufacturing Co. — Contracting Engineers



panel length 66% for Cosden Petroleum

Panel planned for 45 feet, then reduced to 15 feet with Foxboro "small case" Electronic Consotrols

Space saving has taken on a new meaning at Cosden Petroleum Corp. At Cosden's Big Spring, Texas refinery, a UOP Alkar† unit, a styrene plant, and a steam plant are all electronically controlled by one 15-foot Foxboro Modular Console.

When Cosden Petroleum specified Foxboro "small case" Electronic Consotrols and modular consoles, 30 feet of panel space were eliminated for a considerable saving in building construction costs alone.

What's more, Foxboro packed 61 Electronic Consotrol Controllers, plus 100 indicating and recording points into the 15-foot panel — and there's still room to spare for tomorrow's instrumentation needs! Spare panel cut-outs for 35 more controllers and 9 more recorders are pre-wired and ready for service. All Cosden needs to do is hook up the transmitter leads at the bottom of the cabinet and slip the recorder or controller into the panel.

Maintenance men also like the easy way they can transfer instruments on the modular console. Instruments slide in and out of their housings as easily as drawers. A simple plug-in connection puts the instruments into action.

You too, can save space, save time, save money — with Foxboro Electronic Consotrols.

Write for Bulletin 9-12. The Foxboro Company, 6010 Neponset Avenue, Foxboro, Massachusetts.

Reg. U. S. Pat. Off.

FOXBORO

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165,000 gallon capacity cargo tank being lowered into saddles in petrochemical barge hull. Lifting device (partly shown) has 600 ton capacity.

Rubber lining being applied to unit of a chlorine system. Flow meters, valves and tanks are lined with speed and efficiency. Avondale is the authorized U.S. Rubber Co. applicator for N.W. Fla., Ala., Miss., S.W. Tenn., Ark., and La.

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Contact Avondale today about your next project. Use our skills and ability to *your* advantage.

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◀ Weather and corrosion-resistant fire hose house. The Avoncraft Division produces these and other porcelain enamel on steel products including lagging and buildings of all descriptions.

Ethylene storage tank for a large chemical company, shipped by rail. Avondale fabricates pressure vessels and storage tanks in the Main Yard, the strategic location of which permits delivery by truck, rail or barge. ▶

Darling Cast Steel Gate Valves

are made in regular and special compositions to match the exact operating conditions found in high pressure refining, pipeline, power plant, and process industry services.

The revolving double disc parallel seat and wedge construction, with plain "no-pocket" discs, prevents accumulation of line scale and sludge. Discs are free to revolve and either disc will work equally well against the pressure.

Built by skilled specialists under the watchful eye of continuous inspection, these cast steel gates will seat perfectly, release easily, operate surely . . . *you can depend on Darling.*

ENGINEERING SERVICE. To meet unusual operating needs, Darling staff engineers will be glad to work with you in developing special valves for your services. Write, wire or phone for detailed information.

DARLING VALVE & MANUFACTURING CO.

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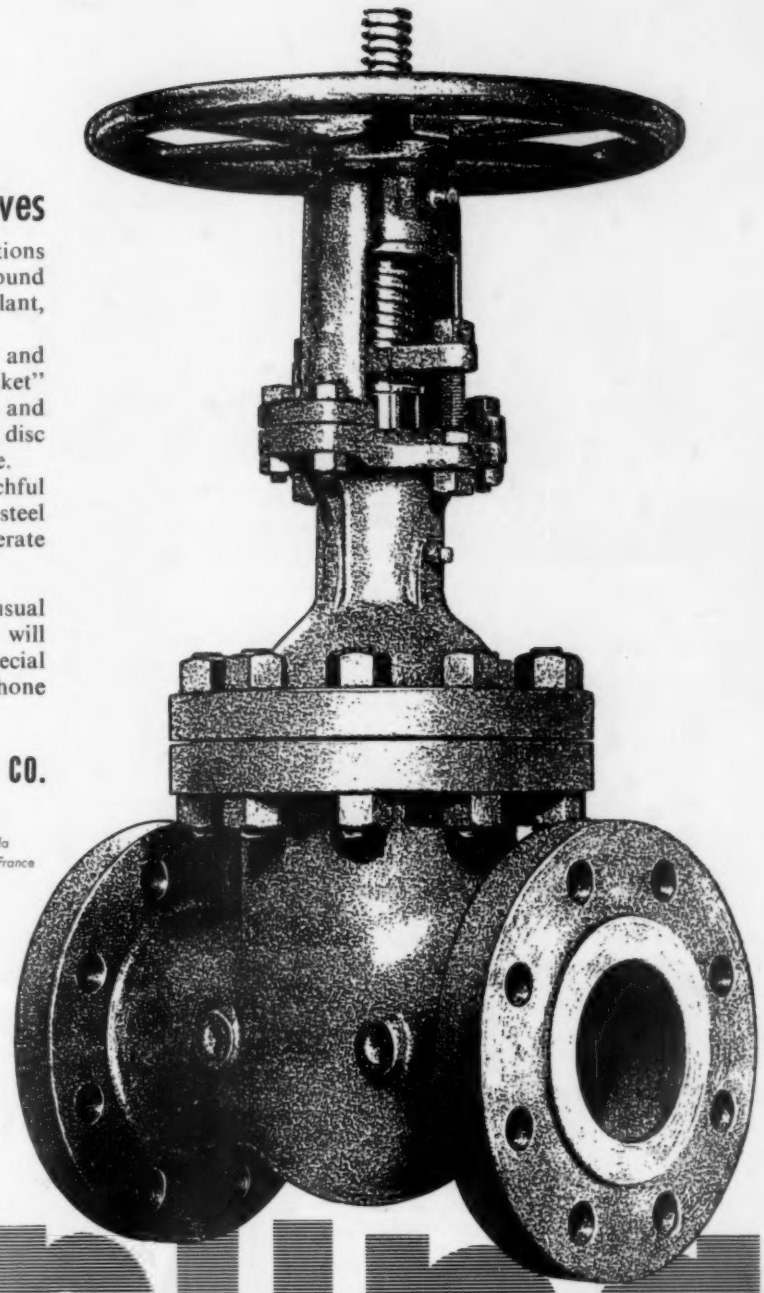

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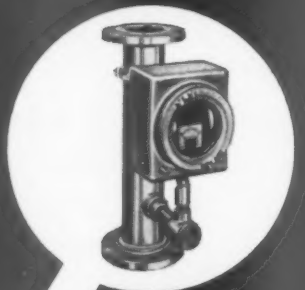
GATE • BUTTERFLY • CHECK • SPECIAL VALVES • FIRE HYDRANTS

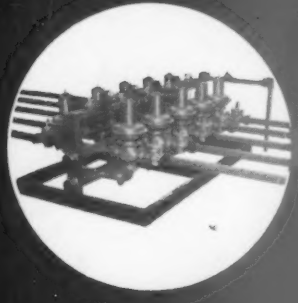
AUTOMATION

You can have it... step by step ...or complete in one leap!

Here are three good reasons for automating with BS&B...

- **ONE SOURCE FOR ALL EQUIPMENT.** Production and processing equipment, electro-pneumatic controls and valves are built and sold by one diversified manufacturer.
- **DESIGNED AND BUILT WITH EXPERIENCE.** Systems and components are designed and built by men who have pioneered oilfield automation.
- **RELIABLE SOURCE OF SUPPLY.** Over a long period of time BS&B has earned a reputation for reliable service to its customers and to the oil industry.





BS&B Automation Headquarters: Box 1714, Oklahoma City, Oklahoma

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The Sign of a Real Bargain in an IRON BODY GATE

Cost-Per-Year is Lower... Initial Cost no Higher

For generations extra-quality, extra-stamina Jenkins Iron Body Gates were regarded as the best buy for the money . . . even though they cost more to buy. Lower maintenance expense and extra years of service more than offset any price differential.

Today, these widely favored valves are an even bigger bargain in true value. *You pay no more for them at the start!* And you get exactly the same high quality and perfection of design for your money.

You can satisfy all your needs from the complete line of Jenkins Iron Body Valves. Jenkins Bros., 100 Park Avenue, New York 17.

AVAILABLE FROM LEADING DISTRIBUTORS EVERYWHERE

JENKINS
MOST TRUSTED TRADEMARK IN THE VALVE WORLD
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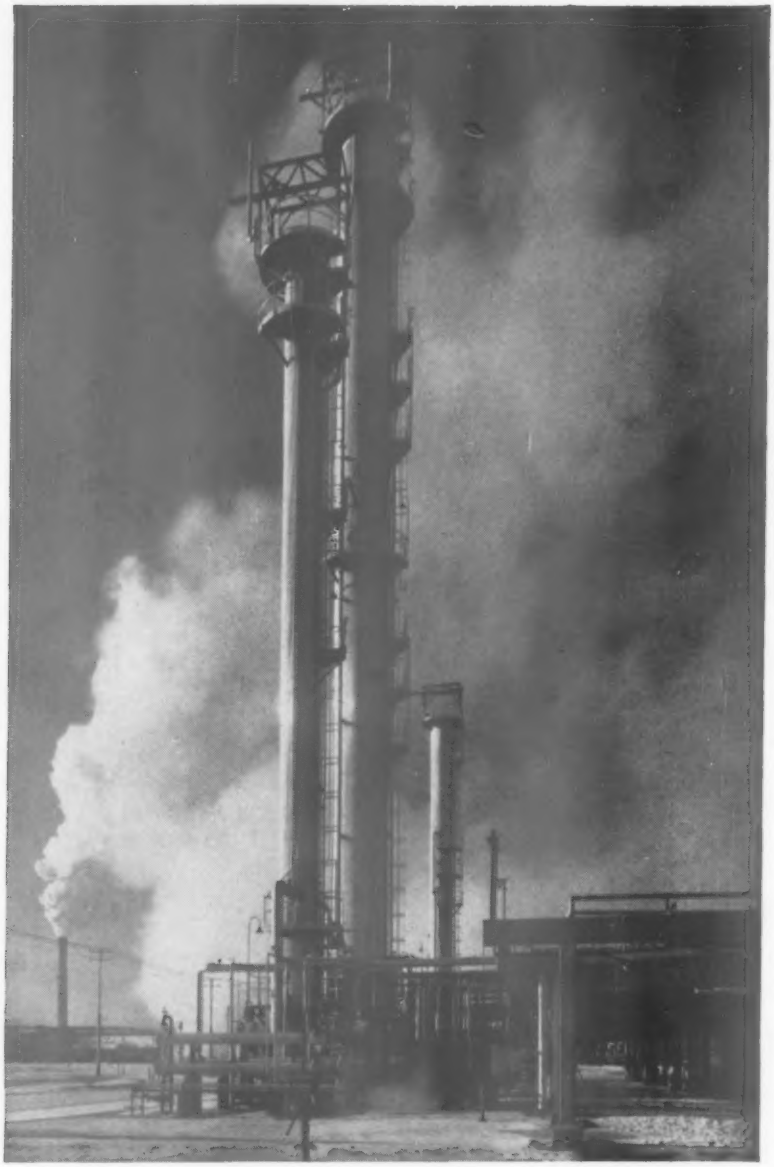


Towers for Texaco

When it comes to producing vessels of this kind, experience on the part of the fabricator is a great asset to the main contractor. To have a fully equipped plant is not enough. There must also be a very advanced knowledge of the actual techniques of steel fabrication. New materials and procedures are always being developed and to reap the benefits, they have to be properly applied.

These towers were fabricated by the Platework Division of Dominion Bridge to designs supplied by Foster Wheeler and are typical of hundreds that Dominion Bridge has made for the oil and chemical process industries.

Dominion Bridge plants across the country are well experienced in this business and the sum total of this experience is applied to every new contract.

72

Platework by **DOMINION BRIDGE**

DOMINION BRIDGE COMPANY LIMITED - FIFTEEN PLANTS COAST-TO-COAST IN CANADA

HOKE Flow Sheet 7

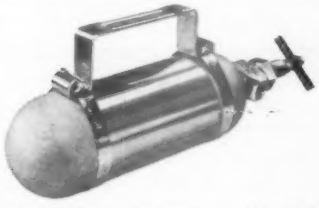
HOKE REPORTS ON FLUID CONTROL

PRESSURE BY THE POUND... no matter how thin you slice it!

Do You Have A Bomb In Your Lab?

In the process industry, sampling cylinders are occasionally referred to as bombs. In recent months, this misnomer has been, unhappily, pretty close to the truth. Some military surplus, low carbon steel, two-piece cylinders have found their way into industry and have been used beyond their rather limited capabilities. Unfortunately, several serious accidents have spotlighted this use as a very real safety problem.

Since sampling is such a serious business, we have perfected, for maximum safety, a seamless, one-piece cylinder. This unabashed declaration of excellence has sound

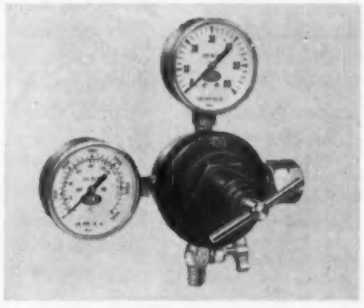


basis in fact – the entire cylinder is formed from a single piece of seamless type 304 stainless steel tube. To quell the qualms of process men, sample contamination is practically nonexistent, and the cylinder resists destruction from most corrosives.

As a further safety guarantee, all standard sampling cylinders are fabricated to meet ICC and other safety regulations. Standard cylinders are available at pressures to 1800 psi (10 ml. to 1 gallon), but higher pressure cylinders can be had on special order.

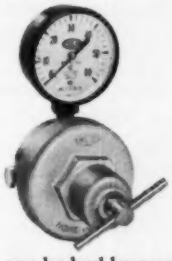
If you'd like additional information on Hoke cylinders, plus a detailed paper on the various methods of collecting samples from process lines, drop us a line. We'll also include details on special cylinder valves, outage tubes and other cylinder accessories.

One trouble with doing something better is that it's hard to stop. This time, we've come up with a new line of pressure regulators. We made them for the technically oriented who have developed high standards and for the penurious purchaser who wants something for (almost) nothing.



One, tagged as the 680 Series, is a highly stable single stage regulator with something for just about everyone. The core of this regulator is its control accuracy of 2% at flows to 2000 SCFH. Two models are available. One delivers 0 to 40 psi and the other 0 to 140 psi and both can handle inlet pressures up to 3000 psi. Use them on any gas compatible with 2024-T4 aluminum alloy, neoprene, polyurethane and Buna-N.

If what we've said sounds good so far, but still won't solve your problems, read on.



We've built a regulator specially for corrosive gases and atmospheres. Available in either all monel or all stainless steel construction, we call it the 640 Series. Spec sheets on this can be had by marking an "X" below.

If you "X" the next box, you'll get a package of useful information on a special regulator that will handle delivery pressures up to 4500 psi with

very high control accuracy. This is a 2 stage spring and dome loaded regulator and we claim that a 50% change in inlet pressure will not change the delivery pressure more than 2%. Operation is simplicity itself. For no particular reason, we call this the 920 Series.

Skeptics should send for all of this information.

'61 PRODUCT PARADE

You'd be surprised at some of the screwball ways our valves have been used (to decided advantage, of course). Hoke distributors are armed to their maxillary third molars with this method madness and will redesign your systems with new Hoke products at the drop of a postcard. Check the PRODUCT PARADE Box.

Hoke's Performance Guarantee—*Every Valve Leak-Tested!*

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Send me complete information on the Hoke products checked below:

- ☐ 680 Series Regulator
- ☐ 640 Series Regulator
- ☐ 920 Series Regulator
- ☐ '61 Product Parade
- ☐ Sampling Cylinders
- ☐ Complete Catalog GC561

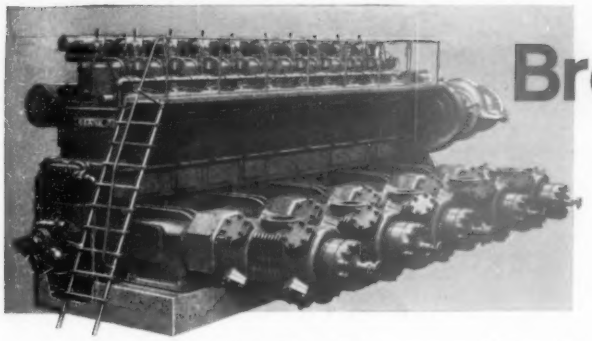
NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

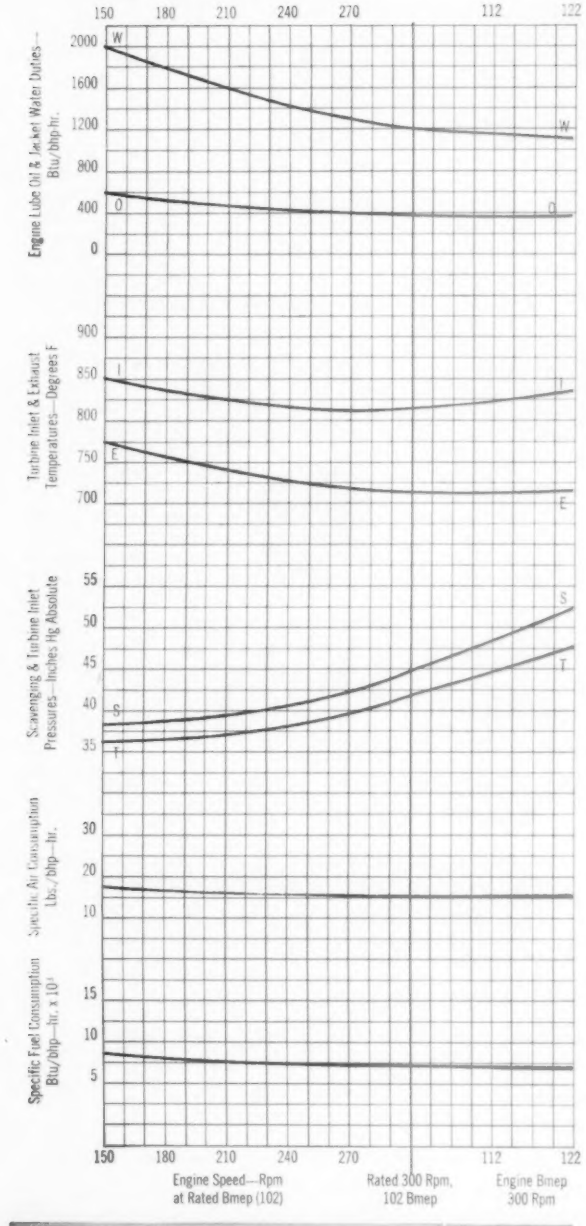
CITY_____ STATE_____

SEE OUR CATALOG IN SWEETS PRODUCT DESIGN FILE



Breakthrough in two variable speed,

Automatic ignition timing plus automatic turbocharger control provide unrivaled speed, load and response characteristics.



Performance curve of Clark Model TLA turbocharged, 2-cycle, gas-engine-driven compressor. Unit features 17"x19" bore and stroke. Rated speed is 300 rpm. Rated bmep is 102 psi. Note the remarkable parallel between the fuel consumption and specific air consumption curves.

Q. What makes two cycle engines so well suited for variable-speed, variable-load applications?

A. It has long been traditional to consider two cycle engines as good prime movers for applications where power and speed are maintained close to 100% of rated load and speed. This may have been true a number of years ago when two cycle engines were single and twin horizontal designs. But the situation began to change with the introduction of vertical, multicylinder machines with direct fuel injection. Subsequent addition of constant pressure turbocharging and automatic ignition timing control have made two cycle performance equal or superior to four cycle engines in acceleration and in response to load or speed changes. Regardless of how fast the load or speed changes, the two cycle engine is able to adjust more rapidly because it fires twice as frequently. As a result the actual amount of load change between successive firings is cut in half, all other conditions being equal.

Q. Why has turbocharging caused such a vast improvement in two cycle engines?

A. The Clark system of constant pressure turbocharging permits variation of scavenging air flow with load to maintain relatively uniform air/fuel ratios over the complete operating range. This variable air supply plus maintenance of optimum ignition timing enables Clark engines to achieve excellent performance from substantial temporary overloads at rated speed down to the usually recommended 50% speed at constant torque.

Q. Why is constant pressure turbocharging so effective?

A. In general, all turbocharged engines are arranged to achieve best efficiency and fuel consumption at a particular design point—usually rated load. The Clark system of constant pressure turbocharging, however, is inherently capable of maintaining optimum efficiency not only at design point, but over an extremely broad operating range as well. The reason: *Clark turbocharging provides a flexible supply of combustion air that varies in direct proportion to load.* It does not depend on pulses of exhaust gas or on engine driven blowers, hence is free to provide the exact amount of air demanded by the engine. At light loads, there is neither a fall-off in performance nor any "lean out" problem arising from too much air. With increased loads, the turbocharger is able to pump increasingly more dense scavenging air into the power cylinders. There is no element in the

cycle compressor performance for variable load applications

system to impede or interfere with the performance of the turbocharger as it responds to the higher power requirements. Thus the fuel/air ratio remains constant through the entire operating range for best engine performance.

Q. Are there other important advantages of the Clark Constant Pressure Turbocharging system?

A. Yes. In addition to efficient combustion, the large amounts of available scavenging air have a cooling effect on the cylinder walls, cylinder heads and piston heads. Possibility of detonation is minimized, better lubrication is assured, and the temperatures of the exhaust gases are controlled as they enter the turbocharger. The cooling effect of the excess scavenging air is especially advantageous at high ambient temperatures. It lowers overall cooling duty and enables the Clark intercoolers to provide adequate scavenging air cooling. There is no need to resort to evaporative cooling of air or other special means of preventing detonation and cylinder wear.

Q. How does Clark achieve such good low speed lugging characteristics?

A. With Clark turbocharged, two cycle engines, compressor capacity can be most easily and efficiently varied by adjusting speed while maintaining at or near rated load torque. *The engine-driven compressor is then operating at rated load all the time, at which condition it functions most efficiently.* The exceptional low speed lugging characteristics are due primarily to frequent power impulses that reduce cyclic speed variation. At low speeds, cyclic speed variation is always accentuated because flywheel inertia is reduced in proportion to the square of speed reduction, and power impulses become less frequent with respect to time. Thus the two cycle engine has a great advantage because each cylinder fires every revolution.

Q. How do Clark two-cycle engines perform under overload conditions?

A. A glance at the chart showing actual test data taken from a Clark turbocharged Model TLA gas-engine-driven compressor demonstrates graphically that the fuel consumption curve is remarkably flat over a wide range. When operating as high as 20% overload under emergency conditions, Clark engines actually burn *less* fuel per bhp than at rated load. Even more important is the manner in which the specific air and specific fuel consumption curves parallel each other perfectly over the entire range. This illustrates the inherent advantage of Clark "true" turbocharging system. Once the engine is started and the turbine is self-sustaining, the turbocharger adjusts itself freely and almost instantaneously to the demands of the engine.

Q. How does ignition timing control improve operating performance?

A. There are two conditions in which ignition timing control is used with the Clark system: At startup and at reduced speeds. During the starting cycle, the timing control automatically adjusts the ignition to increase the flow of heat to the turbocharger. This shortens startup time and substantially reduces consumption of starting air.

At reduced speeds (i.e. from 50% to 80% rated speed), the ignition is automatically regulated to maintain optimum ignition timing consistent with the rate of pressure rise in the cylinder with respect to time. Thus the peak pressure is reached at or near top dead center and expansion of the burned gases takes place most effectively with less tendency to detonation.

Q. What is the net effect of combining turbocharging with two-cycle engines?

A. The user enjoys all the advantages of a two-cycle engine —simplicity, fewer moving parts, greater dependability— plus the advantage of turbocharging—more power in less space, better fuel economy, greater operating flexibility. Clark two-cycle gas-engine-driven compressors are very conservatively rated. Lower bmep eliminates the ignition difficulties and fouling tendencies common in higher rated machines. There are no large exhaust or intake valves to warp, pit or burn. Two-cycle design keeps continuous downward pressure on the power pistons, thereby eliminating oil "pumping." There is no piston ring blowby, the cause of sludging and crankcase oil dilution. The two-cycle engine is less sensitive to detonation under high ambient temperatures. Thus Clark design reduces costly maintenance and assures more profitable "uptime."

Q. In what type of application is Clark capacity variation with speed useful?

A. Pipeline gas transmission where there are few units in a station. Process applications employing gas engine drivers. Gas distribution boosters where the compressors are located near sales outlets. Manufactured gas compressors. Field gathering compressors where few units can be economically employed and wide variation in gas supply is expected.

For more details on how Clark variable-speed, variable-load performance can help you, contact your nearest Clark office or write to:

CLARK BROS. CO., OLEAN, N. Y.

CLARK®
ENGINES · COMPRESSORS
GAS TURBINES
DRESSER INDUSTRIES INC.
OIL · GAS · CHEMICAL
ELECTRONIC · INDUSTRIAL

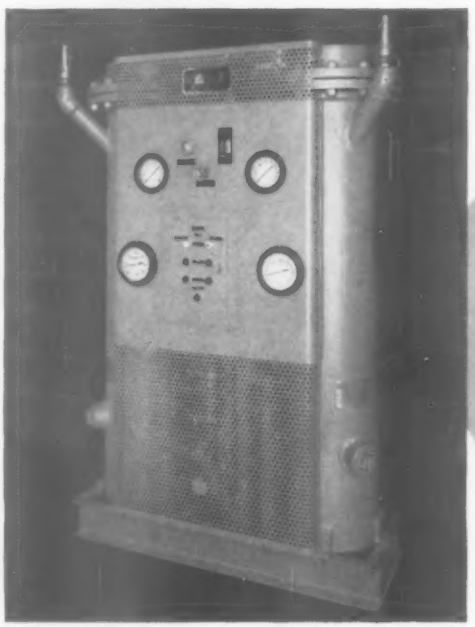
KEMP ORIAD DESICCANT DRYERS

stop moisture best, cost less 3 ways!

1 Complete reactivation
An exclusive 3-zone embedded-heater design gives every KEMP ORIAD DESICCANT DRYER unmatched extra-drying power. Reactivation is always complete and uniform in *any* drying process of air, gases or liquids, assuring maximum desiccant capacity—minimum dew-point performance.

2 Perfect temperature control Heat input is conserved by thermostatic control . . . ideal temperatures are maintained for the highest operating efficiency at the lowest operating costs. An alarm system guards the entire network.

3 Full automatic operation A simple setting of the program timer, and everything is automatically regulated. Drying results with the least pressure loss, lowest operation and maintenance cost. For further details, write for Bulletin D-103 . . . or call your local Kemp Man listed in the Chemical Engineering Catalog.



It always pays to come to

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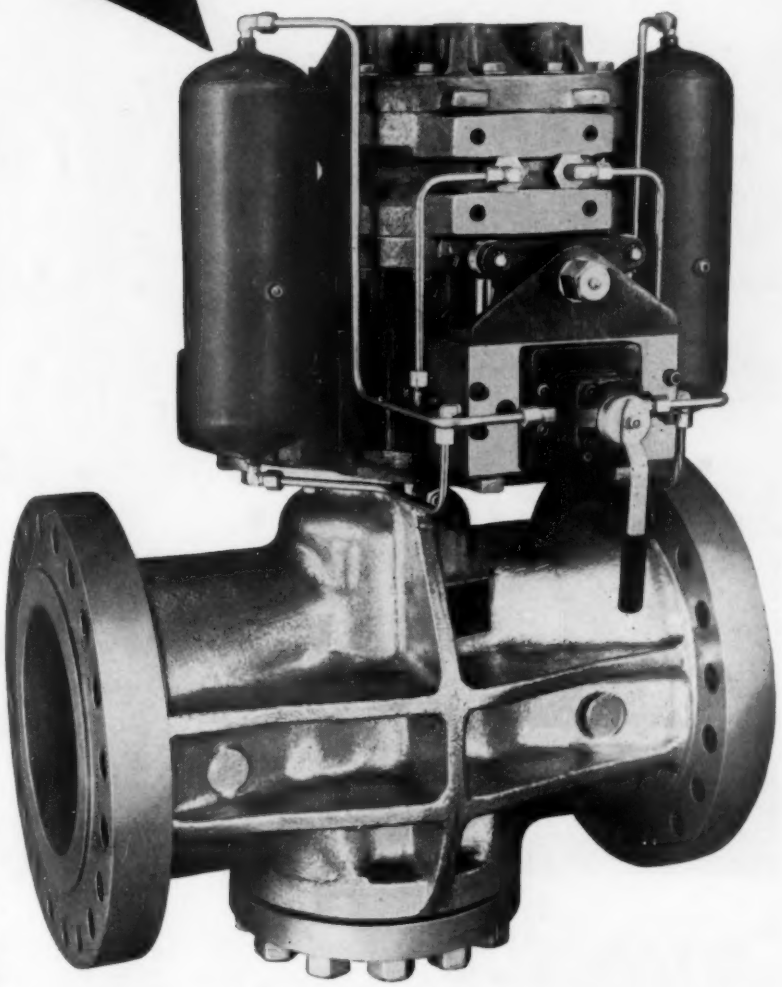
LimiTorque INTRODUCES.....the new type "G" series GAS-HYDRAULIC OPERATORS for plug valves of any size

SIMPLE • RELIABLE • ECONOMICAL • FAST • SMOOTH OPERATION • DELIVERS TORQUE "WITHOUT SHOCK," THROUGH ONLY ONE MOVING PART



These operators have oscillating vane type Hydraulic motors, applying power directly to the plug valve stem—they can be mounted in any position, and are designed to eliminate the usual gearing found on plug valves.

The new LimiTorque type "G" operators are designed primarily for utilization of gas pressure from the pipe line on which they are installed; however, they can be operated by air or liquids from other pressure sources —with or without accumulators.

For pressure operation, the units are equipped with a shear-seal type directional control valve having three positions: Valve open, valve closed, and neutral. For manual operation, the units operate through a specially designed hand pump mounted on the side of the vane motor. The type "G" units can be easily mounted on the plug valve, and because they are directly centered over the shaft . . . It is not necessary to remove the valve from service in order to install the type "G" unit. No maintenance is required with these operators, and it is not necessary to check the level of oil in the accumulation tanks, as this is taken care of automatically.

For complete information, contact your valve manufacturer, or your nearest LimiTorque Sales Engineering Office.

Write for Bulletin 7A-60

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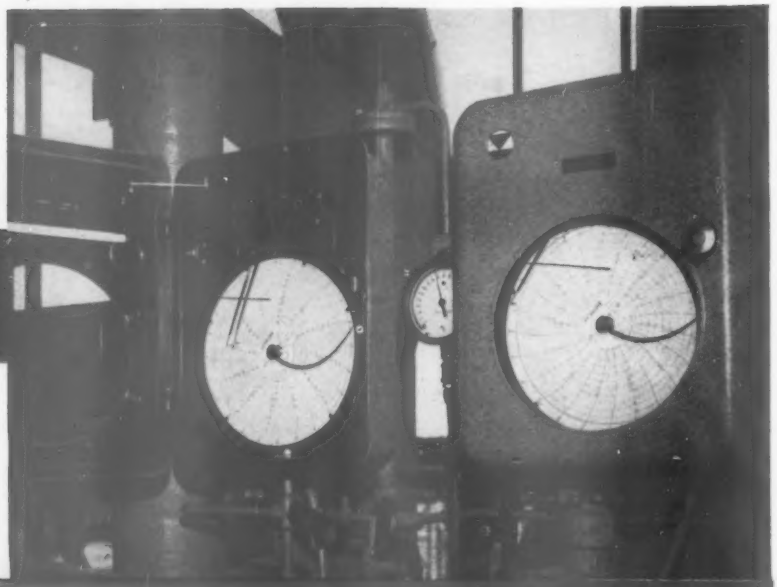

American Integrating Orifice Meters, in a duplex setting, measure gas for boiler at Ft. Lauderdale power plant. These meters are equipped with a fixed gear train to provide a direct reading in cubic feet of gas at base conditions.

AMERICAN® instrumentation solves measurement problem for Florida Power and Light Co.

Florida Power and Light's Ft. Lauderdale power plant. Two of five boilers use 45 million cubic feet of gas per day on an interruptible basis, can consume up to 60 million cubic feet daily.

In each of the eight Florida Power and Light Co. power plants throughout the state, several boilers are fueled by natural gas. Florida Power and Light required a meter that provided a direct reading in actual cubic feet of gas used by each boiler. Measurements would then be transmitted by Telemetering to central data-gathering offices.

American Meter Company supplied a modified Integrating Orifice Meter with a counter reading in cubic feet of gas at standard base conditions that solved their unique measurement problem.

Whether your requirements are simple or complex, you can rely upon American Meter's 125 years of engineering experience to give you the dependable equipment you need for years of accurate, trouble-free measurement and control.

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The gate was good...

...but **FLO·BALL**® *is better!*

Flow capacity was always the gate's strong point. But, to go from open to closed required many, many turns of a screw. This screw suffered from wear, backlash and galling. You couldn't operate it quickly. To support the screw, valuable space was taken by bulky superstructure.

As sizes went up, the gate became extremely complex. Problems mounted. Tremendous locking forces sometimes warped the seats. The edge of the gate eroded whenever used for throttling. The sliding motion tended to score the seats. Dirt and solid particles in the line scored the wedge and seat. Leakage was common.

The Hydromatics **FLO·BALL** valve, unlike the gate, contains only one moving part — the ball. Supported top and bottom by frictionless teflon bearings, the ball turns smoothly, is always in contact with the seat. Tight sealing is a natural by-product of this design. So is maximum flow. Under normal service, the valve should last forever. No screws, no wedges, no chattering. On-off takes only a ¼ turn. Maintenance takes a holiday.

Try the **FLO·BALL** for on-off or throttling. You'll be glad you did!

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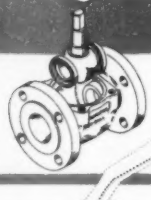
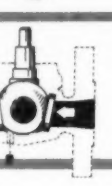
Compare FLO·BALL® feature for feature ...there is no equal!



	FLO-BALL	Ball Valve A	Ball Valve B	Ball Valve C	Ball Valve D	Ball Valve E
1. TOP ENTRY All internal parts can be removed and re-installed without removing valve from line.	√			√		
2. TOP AND BOTTOM GUIDED BALL Provides truly double seal, extends seat life. Makes for easy operation.	√					
3. DOUBLE SEATS Interchangeable and replaceable seats insure sealing in both directions; give double protection against leakage.	√	√	√	√	√	√
4. FLANGES INTEGRAL WITH BODY Rugged, one-piece body design gives greatest possible strength.	√	√		√		
5. ONE PIECE BALL AND STEM No possibility of separation of ball from stem. Always perfect alignment with zero backlash. Foolproofed for assembly.	√					
6. BLOCK AND BLEED Top and bottom guided ball and floating seats provide simultaneous up-stream and down-stream seal . . . a true block and bleed valve. Block and bleed type available on special order.	√					



Specify the FLO • BALL for your application

	SCREWED ENDS	FLANGED ENDS
Sizes	⅛" — 2"	1" — 36"
Pressures	Vacuum — 600 # — 3000 #	150 # — 300 # — 600 # (ASA Rating)
Materials	Carbon Steel, Stainless Steels, Semi-Steel, Brass, Alloy 20, Monel	
Operators	Manual, Hydraulic and Motor	
Your Choice of FLO-BALL Types	Two-Way, Three-Way, Fire-safe, High Pressure (to 10,000 psi), Cryogenic, etc.	

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I am interested in getting complete information on FLO-BALL valves.

My application is_____.

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Hydromatics, Inc.

BLOOMFIELD, NEW JERSEY

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for String of Strength

Rugged Armco Casing gives you the strength you want and need in surface casing. It can save you money, too. Tests show that the variation in collapse resistance for Armco Casing is less than for other types. Because this high collapse resistance is uniform throughout, lighter and lower-cost strings can be set to greater depths.

Other cost-saving features of Armco Casing include: (1) fast field welding —the easy-to-make downhand fillet weld is all that's required; (2) reduced running time—exact 40- or 50-foot lengths mean fewer joints in the string.

Armco Casing, ranging in size from 6 to 24 inches, is distributed by National Tank Company. For complete information, mail coupon.

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There's a complete line of Grove Flexflo regulators for pressure reducing and back pressure services. Flexflos can be supplied self-operated, pilot-operated or with Grove electric, pneumatic and hydraulic operators. A single moving part—a silently flexing rubber tube that can never slam, stick or wedge, makes Flexflos simple, dependable. The tube assures positive shut-off even though foreign matter may be trapped between the core and tube. In cast iron or steel; screwed end: 1″ to 3″, flanged end: 2″ to 12″. Control pressure ranges from 2 psi to 1500 psi.

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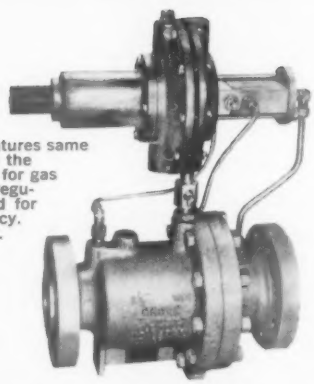
GAS BACK PRESSURE FLEXFLOS

Model 888, self-operated, gas dome-loaded. Setting is fast, easy, without springs or pilots. Recommended for natural gas, air and liquids. Bulletin #888-D.

GAS PRESSURE REDUCING FLEXFLOS

Model 80-820 where extreme accuracy is critical. Sensitive, spring loaded model 820 Grove pilot is a diaphragm controlled, three-way throttling valve. Seven adjustable spring ranges from 2 psi to 1200 psi. Send for Bulletin #813-B.



Model 80-830 features same type of pilot as the 80-820, adapted for gas back pressure regulation. Designed for extreme accuracy. Bulletin #813-B.

Grove Sets Regulator Standards for Others to follow

7078

Model 80-896A, designed for "pounds to ounces" pressure reduction. For inlet pressures to 100 psi and adjustable control ranges from 2 ounces to 20 psi. Bulletin 813-B.

Model 80-833, for low pressure services. 833 pilot is available with three adjustable spring ranges: 10-30 psi, 15-75 psi and 25-150 psi. Bulletin #813-B.

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■ Because he looked BIG and did BIG things, Sam Houston was nicknamed "Six-Feet-Six." Governor of Tennessee, Commander-in-Chief of the victorious army that defeated Santa Anna at San Jacinto, twice president of the Republic of Texas, Governor of the State of Texas — Sam Houston devoted his life to service . . . to his Nation, his State, his people. ■ **Service** — to our customers and their needs — is the sole objective of Western Supply Company — in our heat exchanger design, engineering and fabricating departments; in our expanded Valve and Fittings and Oil Country Supply Divisions. Like Sam Houston, our customers are BIG and do BIG things, and their needs are great. ■ We strive to satisfy those needs, serving in the fields we know best.

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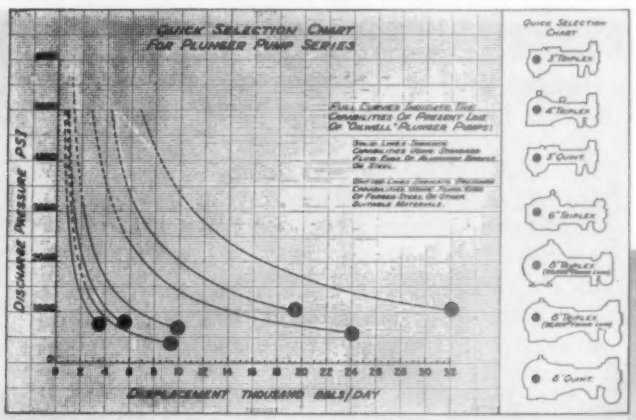
The "OILWELL" string...

PRODUCTS
SERVICES
STORES

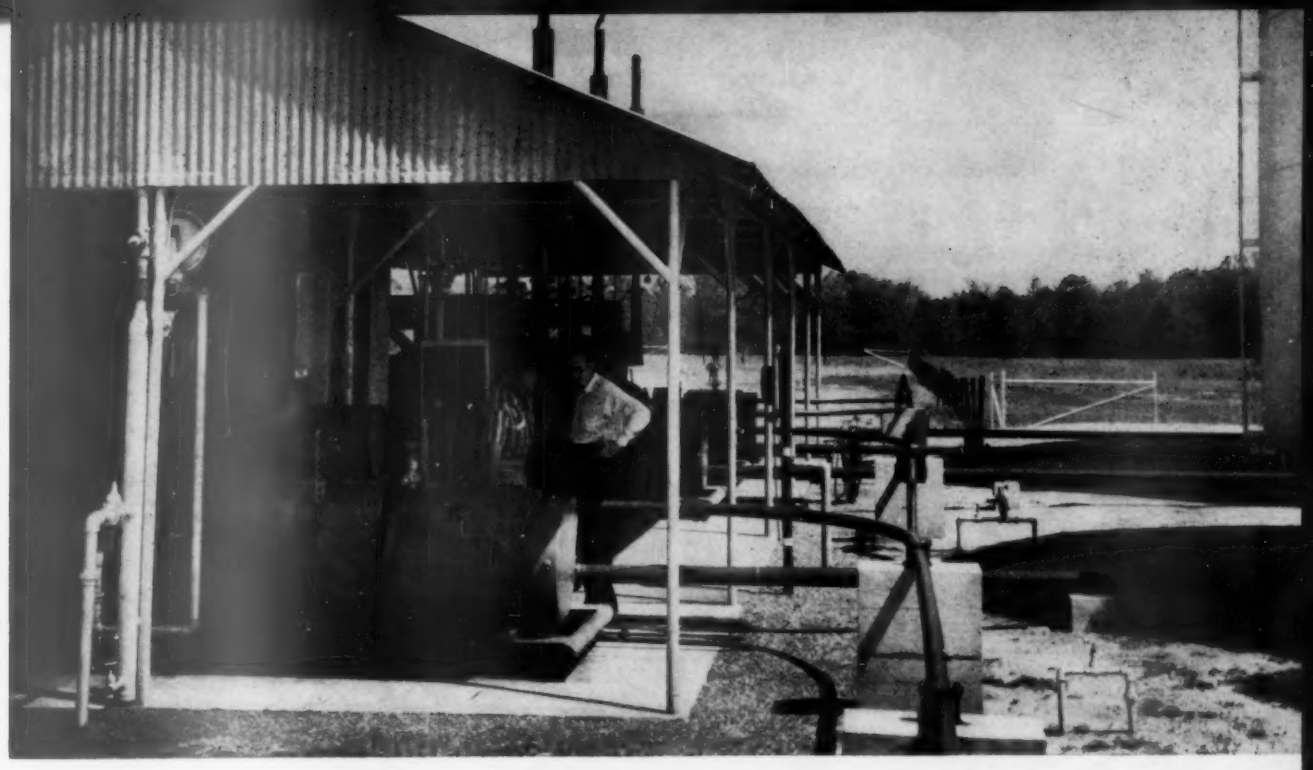
How to take the guesswork out of plunger pump selection

A mistake in horsepower, capacity, pressure requirements or suction and discharge piping arrangements can be costly. Here's a simple, nearly error-proof way of sizing the best plunger pump for your fluid-injection use—get your copy of "Oilwell's" new "Plunger Pump Selection Manual" without delay.



The manual describes in detail "Oilwell's" complete line of seven primary pumps. Volume-pressure range curves make it a simple matter to pick the pump that's right for the job. Picking plunger sizes is simple, too, because you'll find complete performance data for all plunger sizes available with each size pump. The selection manual also contains a wealth of other information including how to apply the pumps and how to size and arrange suction and discharge piping.

Write on your company letterhead for a free copy of "Oilwell's" Manual M29-1060. It's one of our ways of making sure that when you buy "Oilwell" equipment, you get a lot more than our product.



Why "Oilwell" waterflood pumps take it lying down

The pumps in the picture are operating in the New Odom field, and one of them has been pumping 24 hours a day for *eight months* without stopping. Naturally, it's an "Oilwell" pump and its design has a lot to do with its performance.

Every "Oilwell" plunger pump is designed horizontally for eight good reasons: *Low suction* . . . lowness of suction and discharge lines means maximum utilization of suction head and simplifies piping layout. *Less deadweight on crankshaft* . . . eases bearing loads, minimizes vibrational stress in frame and piping. *Simpler thrust transmission* . . . eliminates overhead yoke and pull-rod assemblies. *Cleaner installations* . . . any leakage is confined to frame cradle by gravity. *Natural valve motion* . . . fewer parts needed. *Low center of gravity* . . . reduces vibration that can cause piping stress and fatigue. *Safer maintenance* . . . does away with ladders and neck-craning. *Easier maintenance* . . . greater accessibility.

There's a wide selection of top-performing "Oilwell" Triplex and Quintuplex pumps for waterflood applications, LPG Flood, Pressure Maintenance, Formation Fracturing, Acidizing and Cementing, Salt Water Disposal, or you name it. Whatever your requirements, call on your "Oilwell" representative for complete information and help in the planning stage.

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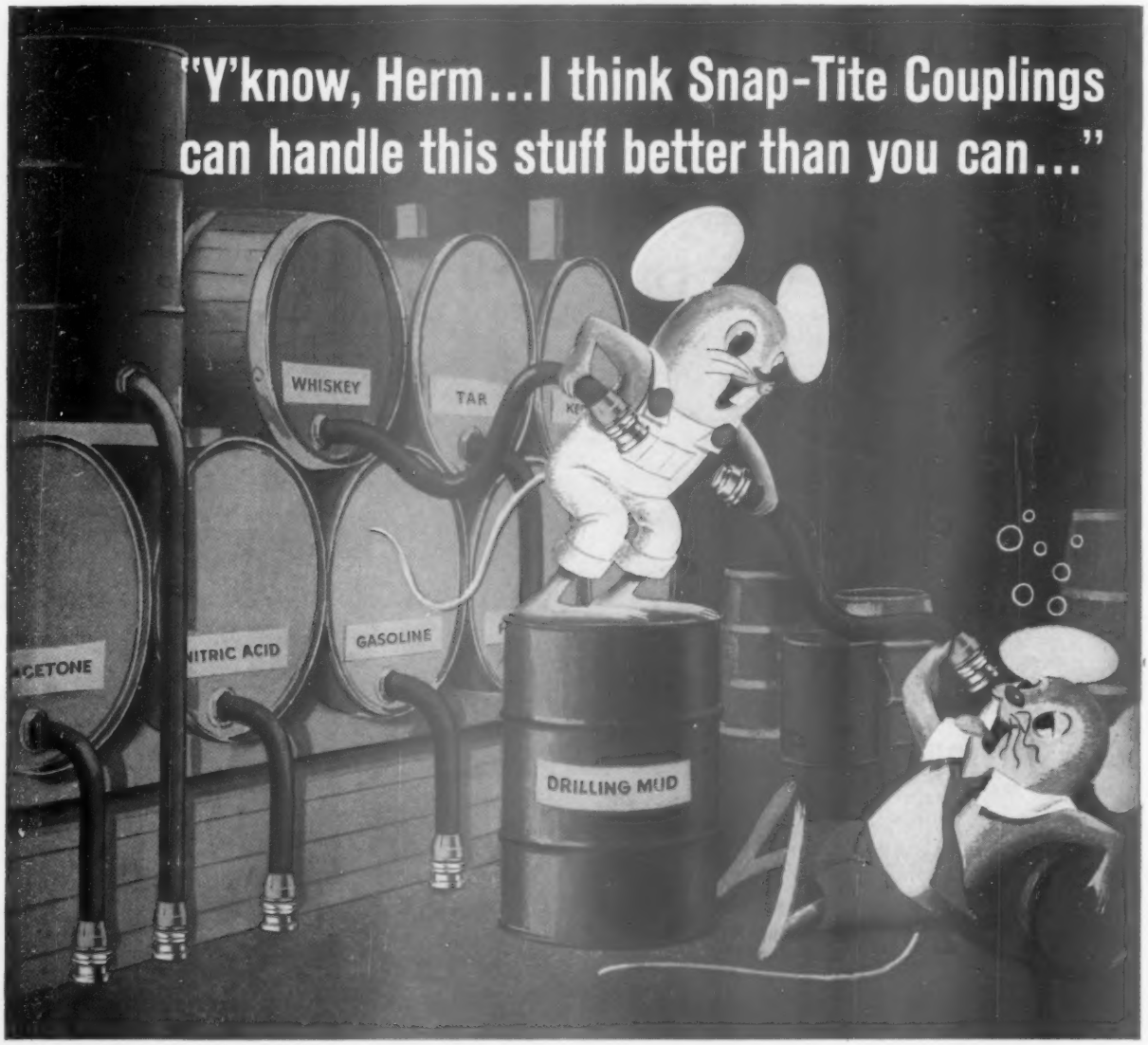
Off the shelf

It's all on the shelves in an "Oilwell" store, everything from subsurface pumps to mud gauges. Whatever you need in the way of production or drilling equipment, and whenever you need it, your nearest "Oilwell" store can take it off the shelf, load it, and it's no more than a short trip from your lease. That's because there are "Oilwell" stores, sales offices, warehouses and conversion centers (*and* pump shops) located *throughout* the oil country. If you're near oil, you're near an "Oilwell" store.

USS **Oil Well Supply Division of United States Steel**

Executive and Export Offices: Dallas, Texas

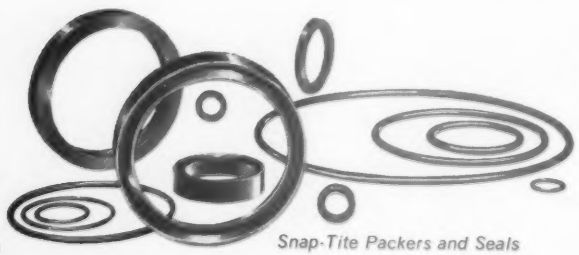


A complete choice of packers and seals permits Snap-Tite quick-disconnect couplings to handle over 600 different fluids! *(some of them mighty tough)*

Whatever fluid you're working with, chances are Snap-Tite couplings can handle it. Because every-one of the thousands of Snap-Tite quick-connect valved couplings comes with a wide choice of rubber packers and seals, selected according to the fluid in use. The right choice, of course, is vital for the seal is the very heart of the coupling.

To assist you in the proper selection of coupling seal material, Snap-Tite, with the assistance of suppliers of synthetic rubber materials, has recently compiled a comprehensive Packer Usage Guide —the first of its kind in the industry.

For the Packer Usage Guide, and for complete information on the correct choice of quick-connect, quick-disconnect couplings for the fluids *you* use, write Snap-Tite, Inc., Union City, Pa.



Snap-Tite Packers and Seals

Snap-tite

UNION CITY, PA.

ST-61-02

BASIC for Process Control

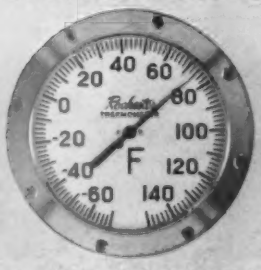
Process engineers searching for a single source for a wide variety of products are sure to find the value of these American-Standard Controls Division products. This is true of anyone who must control or indicate the pressure or temperature of gases and fluids or electrical energy.

High Pressure Gauges

Accuracy plus elimination of recalibration are built-in features of the Rochester line of high pressure gauges manufactured by American-Standard Controls Division. No moving parts—no friction—makes it virtually impossible to wear out this gauge. Life expectancy is more than 250,000 cycles based on use from 0-50% of scale range. Available with adjustable mounting ring for flush or panel mounting. Dial size 4½" or 6". For pressure applications up to 10,000 psi.

AMERICAN-Standard
CONTROLS DIVISION

Industrial Thermometers



Rochester bimetal industrial dial thermometers provide extreme accuracy, are hermetically sealed and can be externally calibrated. Available in standard dial sizes from 1" to 5", and with scale ranges from minus 150°F to 1000°F.

AMERICAN-Standard
CONTROLS DIVISION

You can get detailed information on any of these products by writing American-Standard Controls Division, 5900 Trumbull, Detroit 8, Michigan.

Pressure, Temperature Controls

ASCD makes a wide variety of heavy duty controls for either pressure or temperature applications. They are extraordinarily rugged, can be designed to meet almost any condition.

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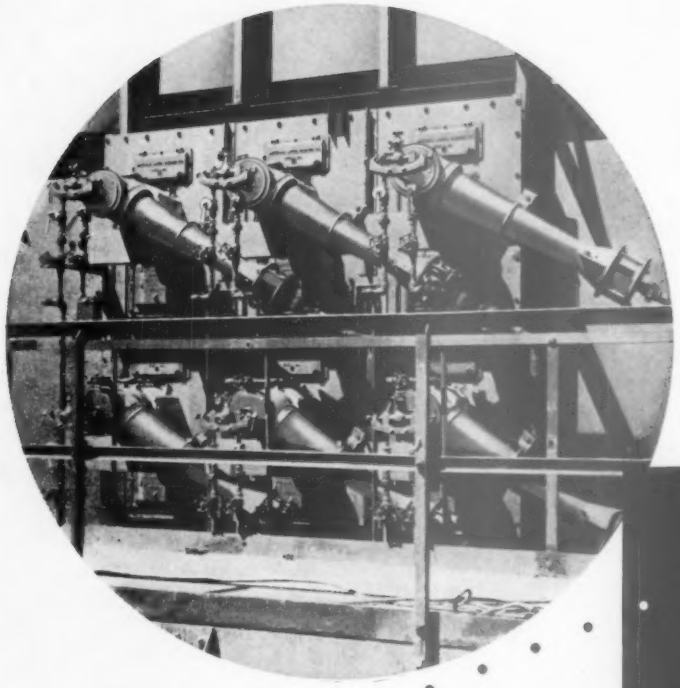
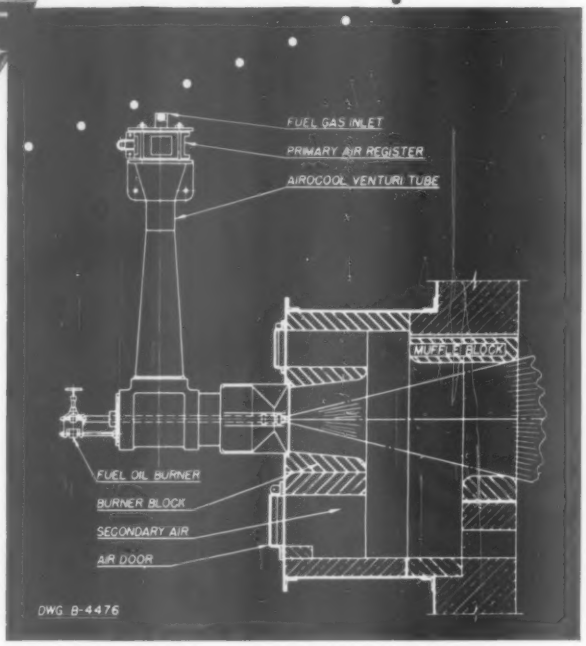


NATIONAL AIROIL OIL-GAS TANDEM COMBUSTION UNITS



Fire World's Highest Thruput Crude Distillation Unit

At Tidewater Oil Company's modern Delaware Refinery, this huge crude furnace now has the world's record capacity of 150,000 barrels per day. It is equipped with National Airoil Burner Company's exclusive Tandem Block Combustion Units . . . easily capable of exceeding the designed capacity of the furnace when burning either liquid or gaseous fuels.

These Tandem Units will burn up to high viscosity residuum oils and/or varying molecular weights of refinery gases. They have high individual heat liberating capacity as well as turn down ratio on natural draft thus avoiding the cost of a blower system. They will operate with low excess air.

Because these high combustion efficiency Tandem Units liberate a large proportion of heat by flame radiation to the heat absorbing surfaces, they increase the days on stream by reducing flame impingement with its accompanying high maintenance cost to tubes, brick work, etc.

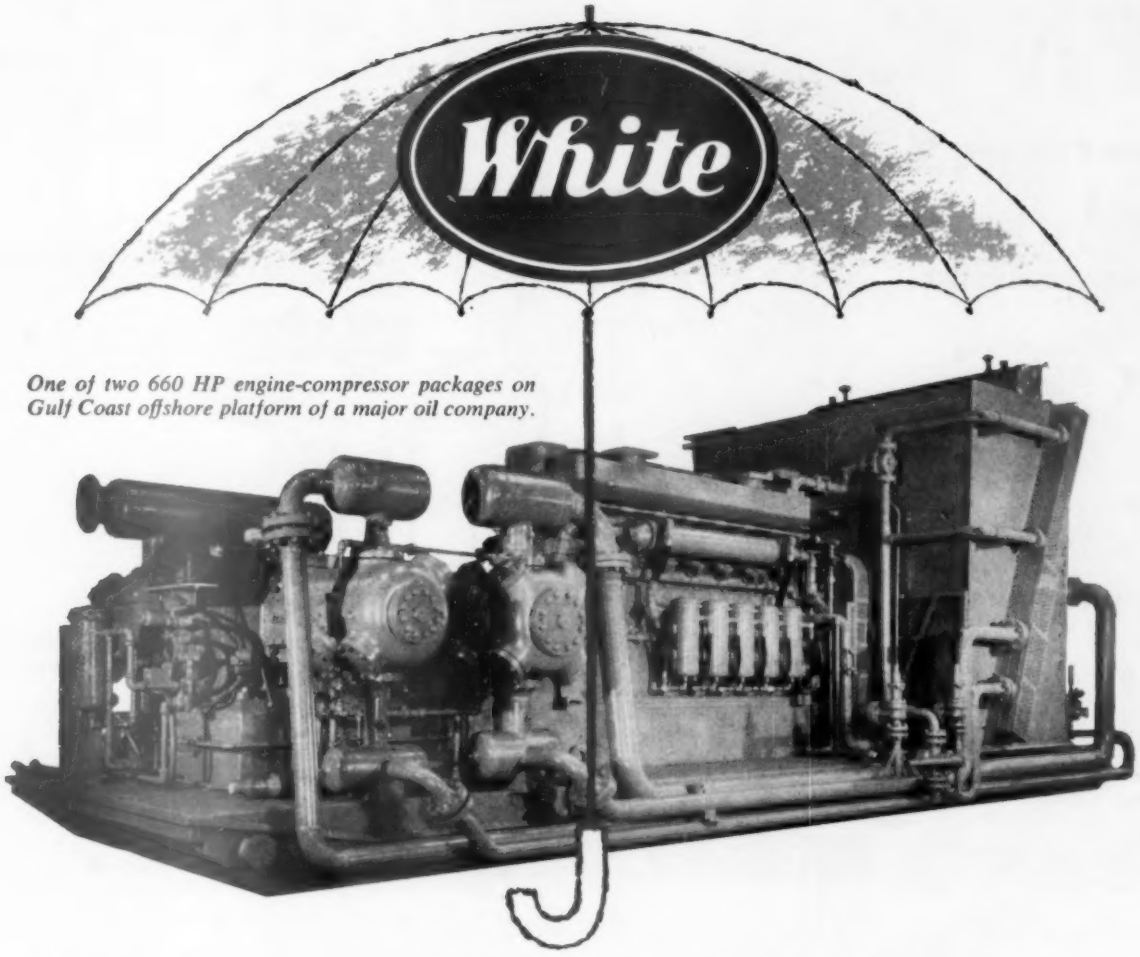
NATIONAL AIROIL BURNER

Established 1912
Incorporated 1917

NATIONAL AIROIL BURNER COMPANY, INC.

1284 E. Sedgley Avenue • Philadelphia 34, Pa., U.S.A.

Industrial Oil Burners, Gas Burners and Combustion Equipment



One of two 660 HP engine-compressor packages on Gulf Coast offshore platform of a major oil company.

White's single responsibility covers Engine and Compressor ALL THE WAY

White-Superior 200/1000 BHP Compressors are designed for exact match with Superior *medium speed* gas engines. Both units are precision built to identical standards at White in Springfield. White therefore assumes *complete and undivided responsibility* for all vital parts on its direct-driven, balanced opposed engine-compressor sets.

Single responsibility *all the way* starts with pre-engineering (selecting the right combination for your job) . . . extends through manufacturing, the installation alignment check-out and start-up. White also provides on-the-job training of your personnel for proper operation and maintenance of complete unit. You'll find factory service and parts readily available from White's extensive field service organization.

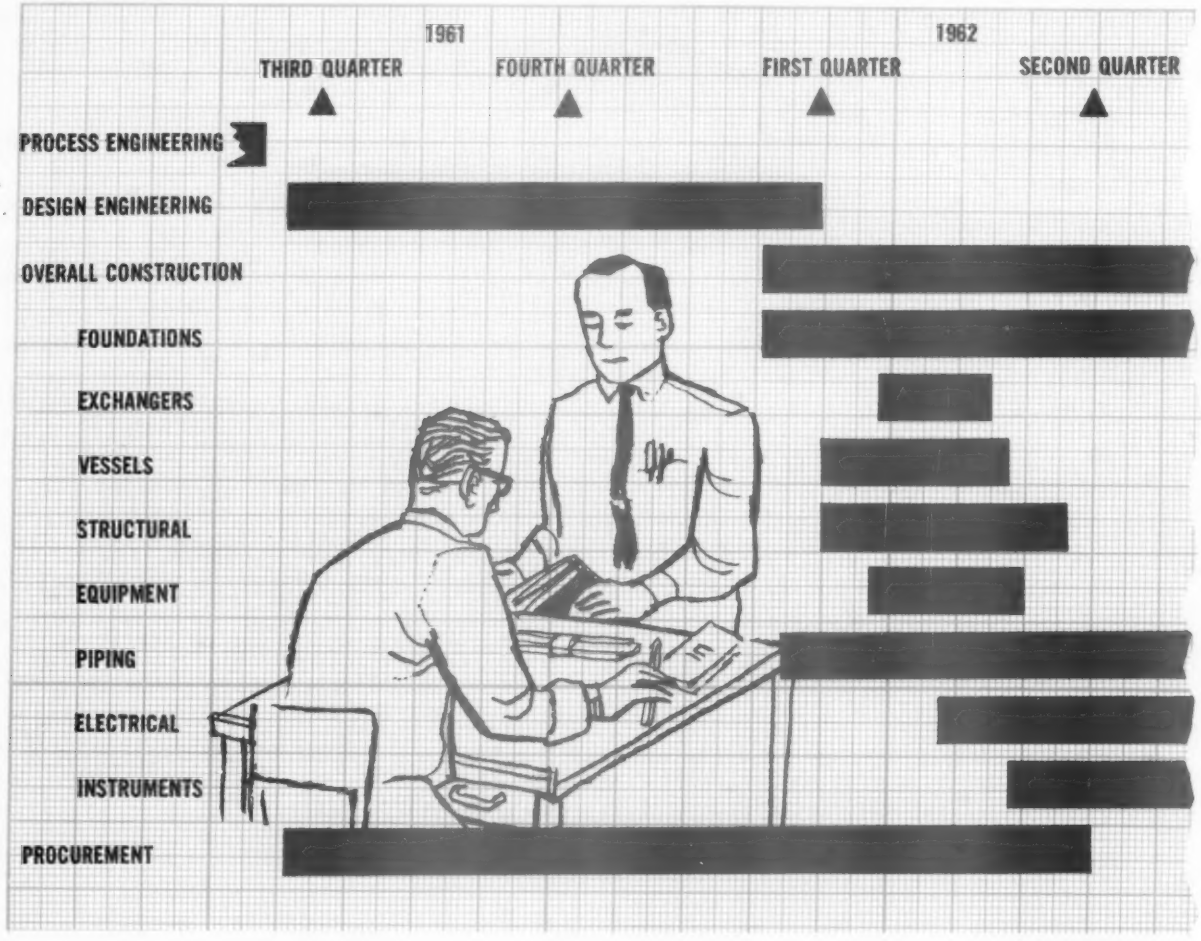
Two, four and six-cylinder, single or multi-service compressors are available properly packaged (see list) and ready for service. For engineering assistance or Bulletin 124, contact nearest White representative or write today to White Diesel Engine Division, Springfield, Ohio.

White DIESEL | Superior ENGINES

White Diesel
ENGINES / COMPRESSORS

WHITE'S AUTHORIZED PACKAGERS

West Coast	Guy T. Martin & Co., Inc.
Rockies	Stearns-Roger Mfg. Co.
Mid-Continent	Southwest Industries, Inc.
Canada	Southwest Barber, Ltd.
Canada	Stearns-Roger Engr. Co., Ltd.



Progress Continues at Kellogg on Monsanto's New Phenol-from-Cumene Plant

The largest phenol-from-cumene plant in the United States is now in the mechanical engineering stage at Kellogg's New York Offices. Designed to produce 75 million pounds per year of high purity phenol, plus large quantities of acetone, the plant will be built at Chocolate Bayou, Texas, for Monsanto Chemical Company.

Full responsibility for engineering, procurement, and construction has been assigned to The M. W. Kellogg Company. A major portion of the process design is based on information licensed from Hercules Powder Company.

Feeds to the cumene section will be benzene and propylene; both will be produced by Monsanto at Chocolate Bayou. Feeds to the phenol section will be cumene and air. The entire project, part of the huge multi-million-dollar chemical complex Monsanto is building at Chocolate Bayou, is scheduled for completion in the summer of 1962.

Kellogg-Monsanto teamwork at Chocolate Bayou is another example of Kellogg's active participation in helping chemical, petrochemical and refining companies achieve their broad investment goals. To obtain information on how the Kellogg organization can translate your new-plant investment into the finished plant, you are cordially invited to contact The M. W. Kellogg Company.

THE M. W. KELLOGG COMPANY

711 Third Ave., New York 17. *A subsidiary of Pullman Incorporated*

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Kellogg International Corporation, London
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Kellogg Pan American Corp., Buenos Aires
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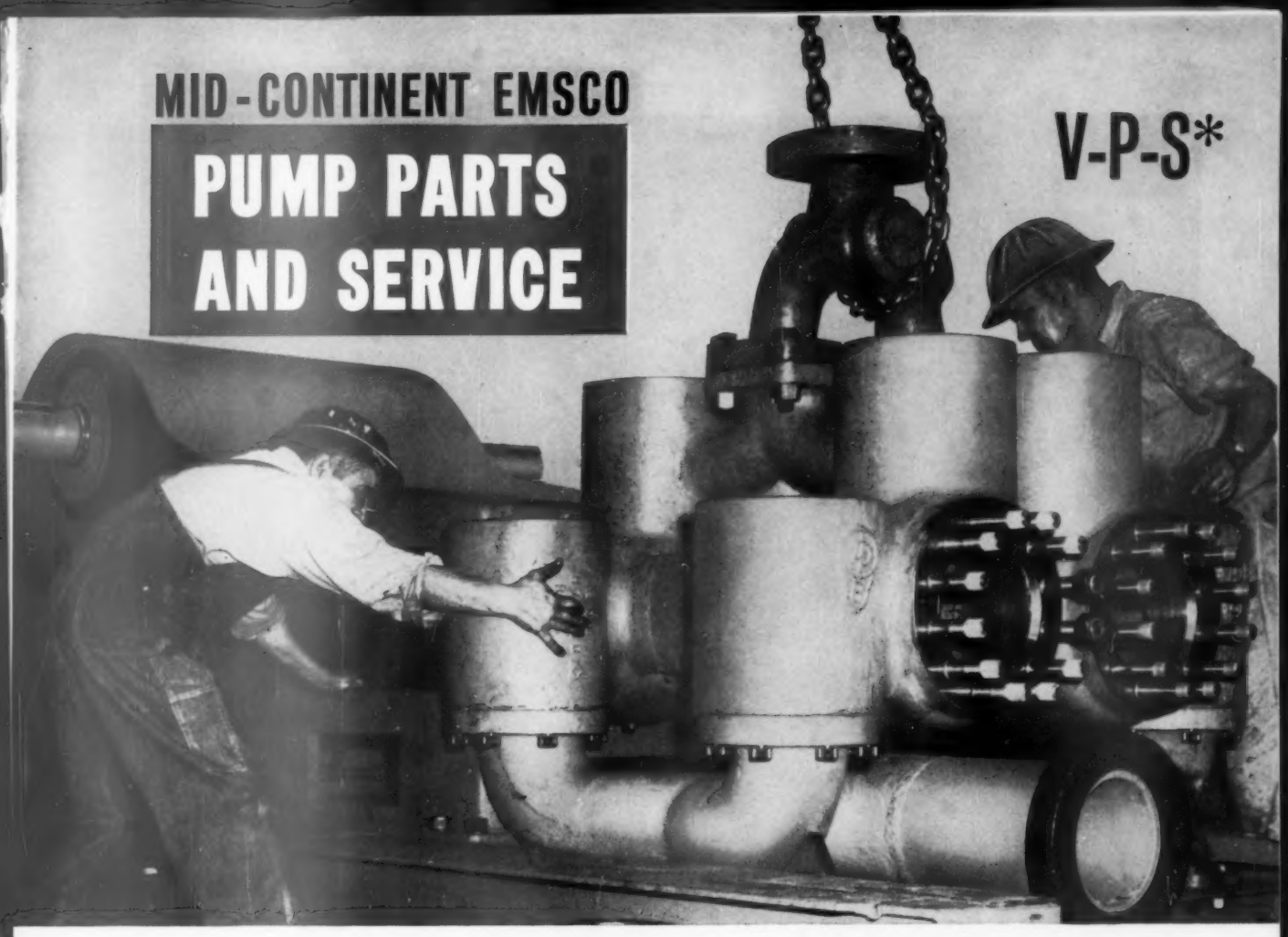

Available throughout the active oil fields

Strategically located pump parts and service centers are maintained to assure Mid-Continent Emsco pump users of top pump performance. Our factory trained servicemen are thoroughly schooled in preventive maintenance and can help avoid costly pump down time. If problems develop, call our nearest service center for Mid-Continent Emsco pump parts and service.

*VALUE-PLUS-SERVICE

SP1-1

MID-CONTINENT SUPPLY CO.

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

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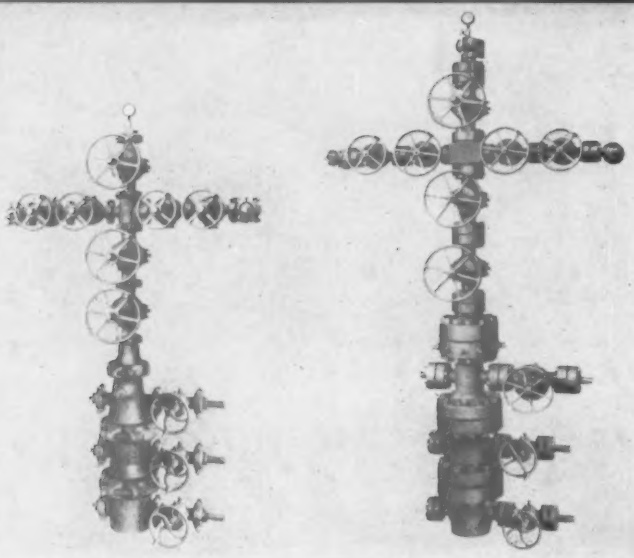
It's Smaller...



It's Better BECAUSE OF GRAYLOC

With only two bolts per connection, there's no simpler connection to assemble—and because *Grayloc*® connections require less space, the complete assembly is smaller. Yet for all its simplicity and compactness, *Grayloc* Wellhead Assemblies have been used on the highest pressure wells thus far discovered.

Grayloc connected assemblies are faster and easier to install, weigh less and are less expensive than equally rated flanged assemblies. They resist vibration and retain a tight seal after original assembly without further attention.

A Gray representative will be glad to show you how much better *Grayloc* connected wellhead assemblies can work for you. Write today for additional information and the Gray catalog.

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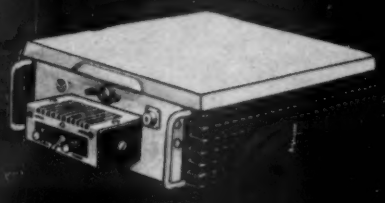
VALUE-PACKED



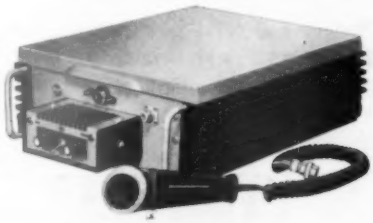
Wisely used transistors enhance the value of RCA "LD" 2-Way Radio and give it built-in dependability

In designing this efficient new "LD" equipment, RCA engineers wisely gave special consideration to the transistor. Only "stock" transistors capable of being serviced with existing test equipment and techniques are used—and only in circuits where they do the best job in cutting battery drain. Tubes are used where they can stand up under high temperatures, heavy voltages—jobs that tubes do best.

As a result the "LD" is not OVERtransistorized, is compact, yet accessible, miserly in power consumption yet value-packed to pack a punch in performance.

Leave the radio on when engine is off—battery drain is negligible. Use it on the roughest roads—transistors and sealed circuits give added assurance it can take it under gruelling conditions.

Specify the RCA "LD" and you can be sure it will stand in back of your endorsement. Lease or purchase plans available. RCA authorized service available. Ask your RCA Representative for complete descriptive literature. Or mail coupon below.



The Most Trusted Name in Radio

RADIO CORPORATION OF AMERICA

RADIO CORPORATION OF AMERICA
Telecommunication Center, Dept. AD-89
Meadow Lands, Pa.

Please send me FREE literature on the new RCA Transistorized "LD" Mobile Radio.

☐ Have RCA Communications Specialist contact me and explain why this is today's best value in 2-way radio.

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CROUSE/HINDS

WJB and WJBF Series

JUNCTION CONDULETS®

NOW AVAILABLE IN 28 DIFFERENT SIZES...

Heavy-duty junction boxes have to be more than mere splice points. That's why the Crouse-Hinds WJBF floor-Condulet is built to resist wash-down water, atmospheric moisture, dust and alkaline atmospheres — conditions that will reduce an ordinary junction to fireworks long before the Fourth of July. Hot-dip galvanized, cast Feraloy construction does the job.

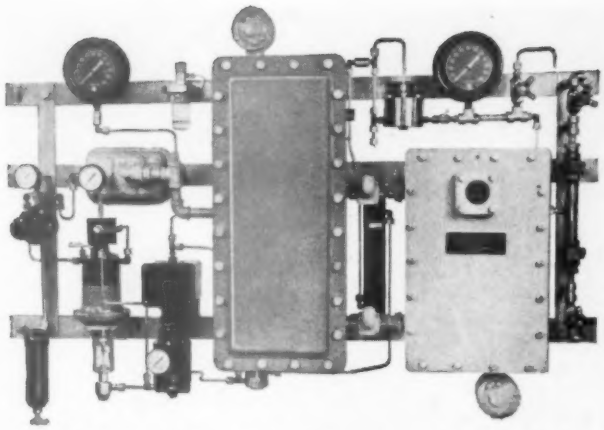
And you can get the same neoprene-gasketed moisture protection in the surface-mounted raintight Crouse-Hinds WJB Condulet. Both types are available in cast aluminum, sold at the same price as Feraloy.

28 sizes of each type are available, ranging from 4"x4"x4" to 24"x24"x12", with or without mounting feet. The number and size of conduit entrances can be specified or Condulets can be drilled and tapped in the field. *For more information check your Crouse-Hinds Distributor.*

CROUSE HINDS

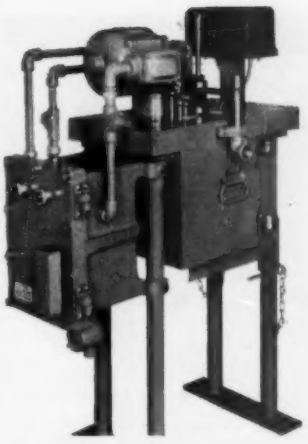
REG. U. S. PAT. OFF.

MAIN OFFICE: SYRACUSE, N.Y. **FIELD OFFICES:** Albany, Atlanta, Baton Rouge, Birmingham, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Corpus Christi, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Oregon, St. Louis, St. Paul, Salt Lake City, San Francisco, Seattle, Tampa, Tulsa, Washington. **RESIDENT REPRESENTATIVES:** Baltimore, Md., Meriden, Conn., Reading, Pa., Richmond, Va., Springfield, Mass.
FOREIGN AFFILIATES: Crouse-Hinds Company of Canada, Ltd., Scarborough, Ont., Crouse-Hinds-Domex, S. A. de C. V. Mexico, D. F.
MANUFACTURING LICENSEE: Peterco, Sao Paulo, Brazil



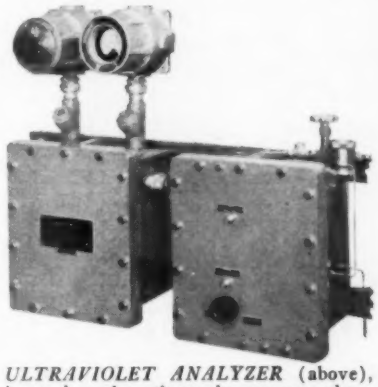
VAPOR PRESSURE ANALYZER (left), pay out: one to three months. Continuously samples and records vapor pressure of gasoline or liquefied gases in a flowing stream.

CONTINUOUS VISCOMETER (right), decreases greatly the cost of plant operation by reducing laboratory analyses of viscosity; aids operators in fast, efficient, quality control of refinery operations. Explosion-proof design. Reliable. Rapid pay out.



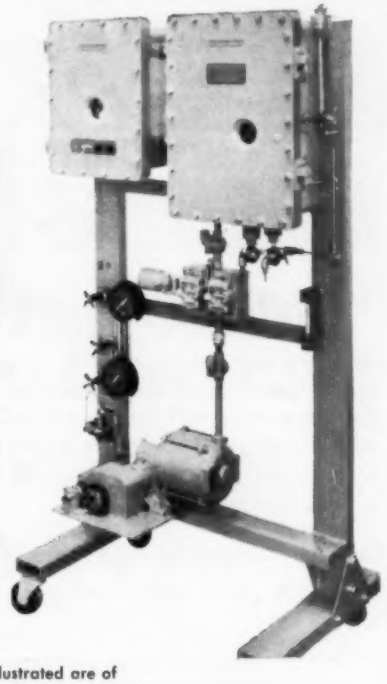
HALLIKAINEN INSTRUMENTS is headquarters for Process Stream Analyzers

Hallikainen Process Stream Analyzers help to reduce costs and improve products. Get all the facts from Hallikainen Instruments, headquarters for process stream analyzers and other precision equipment. Shown here are the latest components for automation, all of which have been proven in every-day operation.

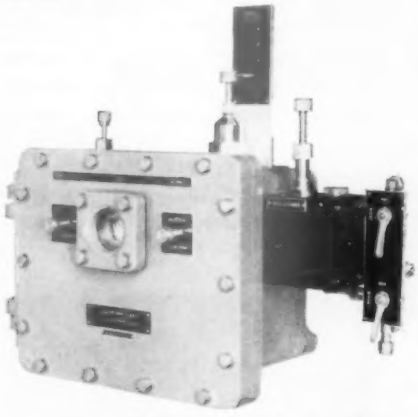


ULTRAVIOLET ANALYZER (above), instantly and continuously measures ultraviolet absorbing components in process plant streams, such as aromatics, diolefins, ketones and aldehydes. Determinations: from few parts per million to high percentages.

BOILING POINT ANALYZERS: Pictured to the right is END POINT model. Analyzers are of two types. (1) Initial and 10%, and (2) below 90% to end point. Both models are continuous; they lower costs, give better yields and uniform products because of immediate tower control. Pay out: 30 to 60 days.



(All products illustrated are of Shell Development Company design)



COLOR ANALYZER (above), gives electrical output signal to permit the recording of color of petroleum products in color range from pale yellow to deep red. Uses ASTM glass color-standards for calibration purposes.

Two of many other Hallikainen products (not shown): (1) *ALKYLATION ACID ANALYZER* for determining the strength of acid in sulfuric acid alkylation plants; (2) *MICROMALYZER*, a low cost, compact precision chromatographic laboratory instrument for detection of hydrocarbons.

Write us today for full technical details

HALLIKAINEN *Instruments*

1341 Seventh Street **Berkeley 10, California**

Phone: LAndscape 4-1757

Engineering Progress Report

FROM UNION CARBIDE CHEMICALS COMPANY

Ethylene Glycol Scores High As Hydrate Inhibitor

In refrigeration-type gasoline recovery plants, the most widely used hydrate point depressant is diethylene glycol. But, ethylene glycol may offer certain advantages as a replacement in your plant, for example . . .

SELECTION GUIDE

ADVANTAGE	Ethylene Glycol	Diethylene Glycol
Hydrate Inhibition	GOOD	GOOD
Ease of Separation	BETTER	GOOD
Cost	LOWER	—
Vaporization Loss	LOW	LOWER
Solubility Loss	LOWER	LOW

HYDRATE INHIBITION

While both ethylene and diethylene glycol give good hydrate inhibition, with hydrate point depressions generally in the range of 60° to 80°F., reports indicate that ethylene glycol may give a greater depression in those cases needing very low separation temperatures.

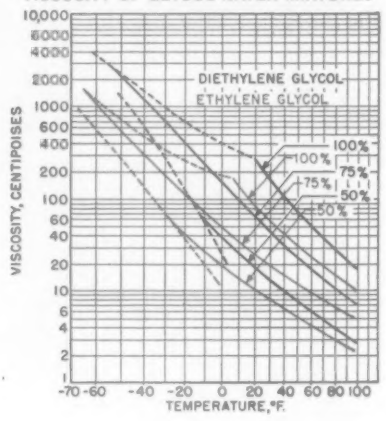
EASE OF SEPARATION

Ethylene glycol-water solutions are easier to separate at very low temperatures than diethylene glycol-water solutions.

This advantage is illustrated in the graph below. At 0°F. the viscosity of a 50 per cent ethylene glycol solution is 20 centipoises, or half the viscosity of the diethylene glycol solution.

An even more marked difference is shown at lower temperatures . . . at—40°C. a 75 per cent ethylene glycol solution has a 300 centipoises viscosity, as compared with 1000 to 2000 for a 75 per cent diethylene glycol solution.

VISCOSITY OF GLYCOL-WATER MIXTURES



COST

Ethylene glycol costs 1¾¢ a pound less than diethylene glycol which means a possible tank car savings of $1,300.

VAPORIZATION

Although ethylene glycol vaporization losses are greater than diethylene glycol's, the difference is insignificant below 30°F., if separator pressure is 750 PSI or higher.

SOLUBILITY

At separation temperatures of 60°F., glycol losses due to solubility should be in the range of 10 to 50 ppm when 50 to 75 per cent ethylene glycol solutions are used; and 20 to 100 ppm with equal strength diethylene glycol.

The higher volatility of ethylene glycol must be taken into consideration in regeneration equipment design and operation; but ethylene glycol may offer advantages in certain systems. Your CARBIDE Technical Representative can show you data on the pros and cons of ethylene or diethylene glycol hydrate inhibition in your system.

For a copy of a new report, "The Glycols as Hydrate Point Depressants in Natural Gas Systems" and a comprehensive bibliography of all the major articles published on gas sweetening and dehydration in the last 25 years, use the coupon.

UNION CARBIDE is a registered trade mark of Union Carbide Corporation.

UNION CARBIDE CHEMICALS COMPANY, Division of Union Carbide Corp., 270 Park Ave., N. Y. 17, N. Y.

Please Send Me

- ☐ Technical data report—"The Glycols as Hydrate Point Depressants in Natural Gas Systems."
- ☐ 24-page Gas Sweetening Bibliography.
- ☐ Please have a CARBIDE Technical Representative call.

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UNION CARBIDE CHEMICALS COMPANY

UNION CARBIDE

Petroleum Storage Tanks of Greater New York Terminal, before backfilling operations. Coating Contractor: West Virginia Paint and Tank Co., Passaic, New Jersey.

Miles Howie, West Virginia Paint and Tank Co., says:

"You only get one chance on buried tanks and you'd better be right the first time!"

That's the way Mr. Howie, Manager of the coating application firm, summarized the approach to protection of these buried storage tanks for Greater New York Terminal. Mr. Howie continued, "We had to lick a serious corrosion threat from salt water penetration of the loamy dockside soil. The coating used had to stand up indefinitely, because of the prohibitive expense of excavating and recoating after the filling operation has been completed."

Bitumastic No. 50, a heavy-duty coating with excellent resistance to water absorption, was selected to protect these petroleum storage tanks, located at Greater New York Terminal, Inc., in Astoria, Long Island. Fast application and excellent bonding characteristics were additional factors in this coal-tar based coating's selection. As Miles Howie put it, "Based on our past experience with Koppers coatings, we know that nothing beats Bitumastic for this heavy service work."

You, too, can find a solution to your corrosion problem in the complete family of Bitumastic coal tar based coatings. For more information, call your Koppers representative or send the coupon. Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa. District Offices: Chicago, Los Angeles, New York, Pittsburgh and Woodward, Ala. In Canada: Koppers Products, Ltd., Toronto.

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BITUMASTIC
COATINGS AND ENAMELS
another fine product of COAL TAR

KOPPERS COMPANY, INC., Tar Products Division
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Gentlemen:
Please send me more information on the Bitumastic family of protective coatings.

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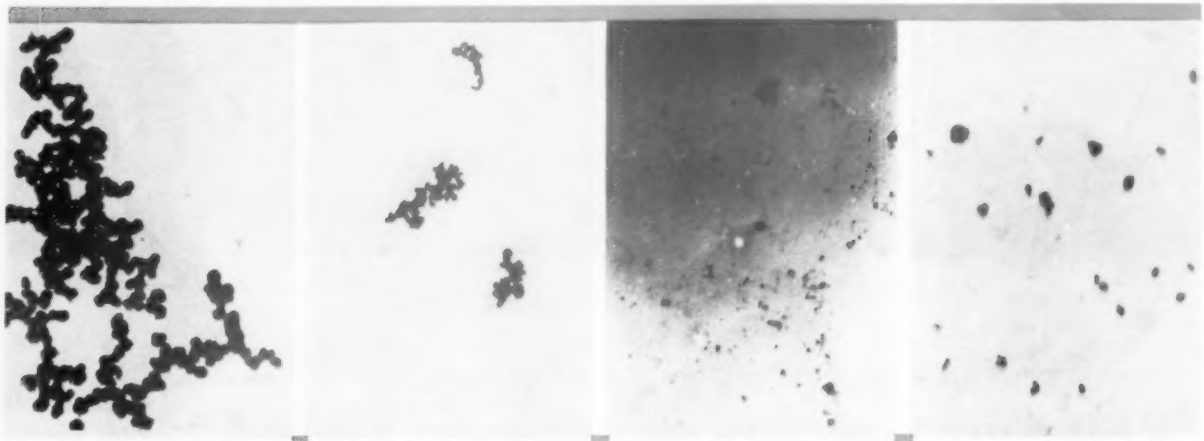
another
TRETOLITE SERVICE
report

TESTS SHOW TOLAD MOST EFFECTIVE MOST ECONOMICAL

for minimizing sludge in diesel fuel

Test samples of fresh #2 diesel fuel were treated with TOLAD* Fuel Additive and two other additives at 100 ppm. These samples along with one containing no additive were subjected to a 12-week storage test at 110°F after which the sludge particles were photographed through a 6000-power electron microscope.

These photomicrographs clearly demonstrate the superior dispersion qualities of TOLAD.



Diesel fuel with no additive shows large agglomerations in excess of 30 microns.†

With Additive "X" at 100 ppm, agglomerations averaged 4-5 microns. Treating cost was $24.60/M bbls.

Additive "Y", at 100 ppm, left hydrocarbon masses larger than 5 microns. Cost: $20.40/M bbls.

Same concentration (100 ppm) of TOLAD Fuel Additive dispersed residue into small particles averaging ¼ micron at cost of $18.60/M bbls.

† ⟼ *One micron, scale.*

Further testing of these samples consisted of the 300°F/90-minute diesel fuel test followed by filtration through a highly retentive glass fiber filter having ½-micron porosity (a test accepted by railroads in approving additives for use in railroad diesel fuel). This subsequent test confirmed the results as indicated by the photos.

TOLAD *pays you by paying for itself* in maintaining the quality and salability of your diesel fuel.

TOLAD is available in 16 formulas to solve your fuel-treating problems. Tretolite laboratories will test your fuel and recommend the correct TOLAD Fuel Additive formula for your specific requirements.

For complete information on TOLAD, or test arrangements for your fuel, call or write . . .

*Registered trademark, Petrolite Corporation.

PETROLITE CORPORATION

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200 South Puente Street, Brea, California

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FA-61-3

TRAPPED ?

Tired - - - Tense - - - Trapped in a tangle of tension because of mounting inventory costs? Delivery deadlines? Don't reach for the tranquilizers - - - Let McCormick, with service centers near you, take the guess-work out of these problems. Call a McCormick man today - - - there's a plant near you.

McCORMICK Steel Company

Steel and Aluminum Service Centers

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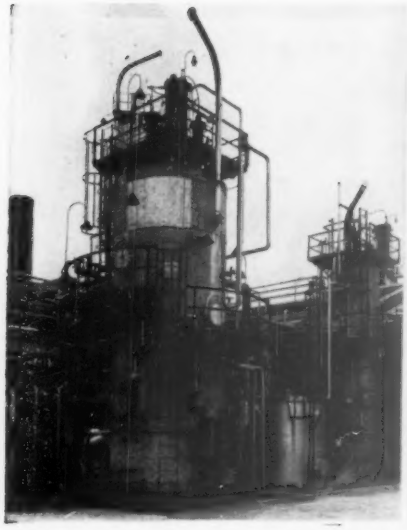
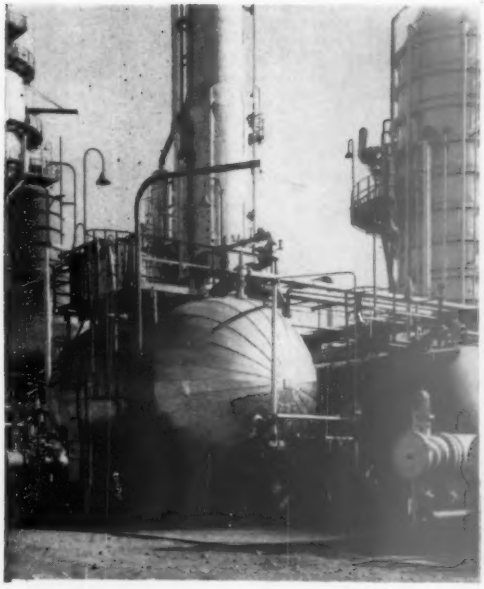


OHIO—Two of three two-stage ELECTROFINING Precipitators for treating kerosine, heavy cat gasoline, and light cat gasoline at Standard Oil Company of Ohio's Toledo refinery, which also utilizes a PETRECO Desalter.

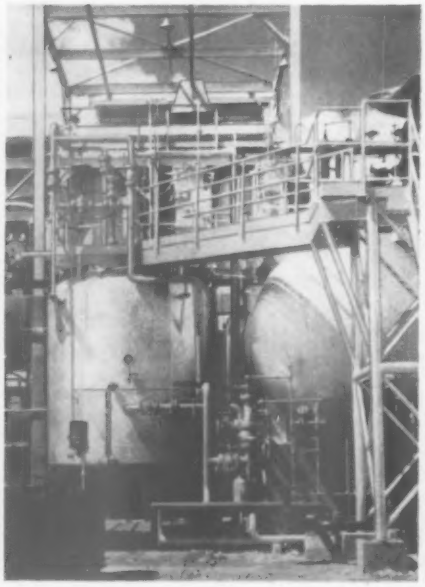
CALIFORNIA—Richfield Oil Corporation, Long Beach, uses a PETRECO* Electric Desalter, a BENDER Catalytic Sweetening process, and four Petreco ELECTROFINING* Precipitators for gasoline, jet fuel, and kerosine treating.

every day...all over the world...refiners are reducing treating costs with

PETRECO PROCESSING EQUIPMENT



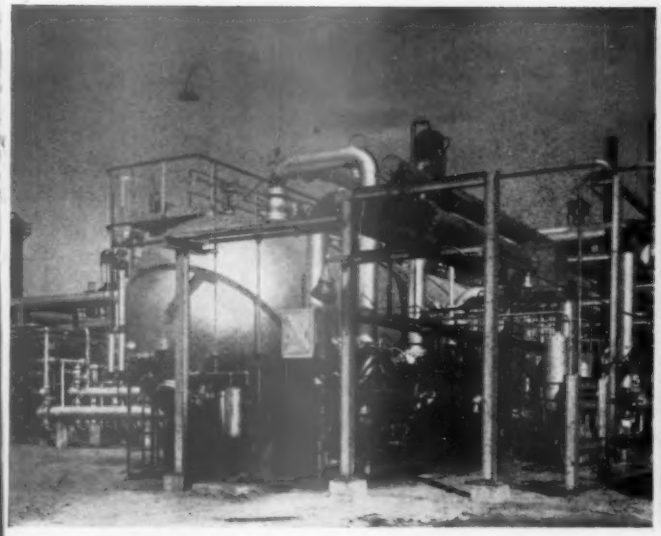
CHILE—PETRECO* Electric Desalter in ENAP Con Con refinery.



NETHERLANDS ANTILLES—Petreco ELECTROFINING Precipitator at a refinery in Aruba.

JAPAN—PETRECO Desalter and ELECTROFINING Precipitator installed in Kawasaki refinery of General Oil Company.

AR-61-1



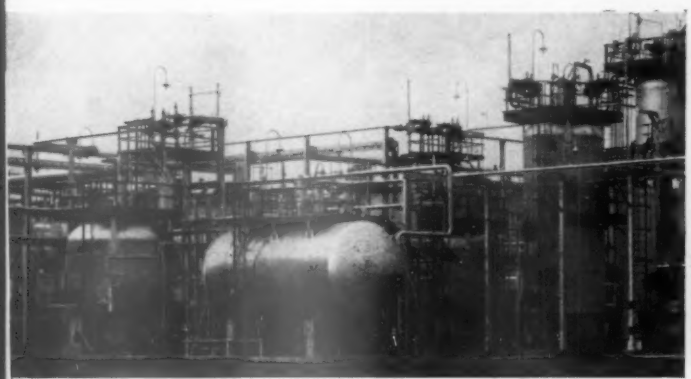
TEXAS—Two-stage PETRECO Desalter in Sunray refinery at Shamrock, Texas.

DELAWARE—PETRECO Desalters on huge Tidewater Association crude unit at Delaware City refinery.

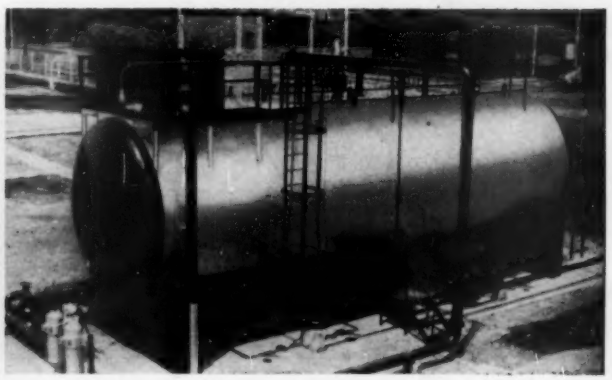
Petreco performance around the world tells a money-making treatment story, easily understood in any language. The Petreco installations shown here suggest how global this understanding is. It grows with every new application, and amplifies itself day after day in the hundreds of Petreco electric precipitation units now in use.

If you don't have this modern treating equipment for impurities removal, sweetening, color specification, stability, "scrubbing" or water-washing, write for complete information on the efficiency and economy of Petreco processing equipment.

Registered trademark, Petrolite Corporation



ENGLAND—Esso refinery at Milford Haven includes PETRECO Desalter, and three Petreco ELECTROFINING Precipitators for distillate treating.



VENEZUELA—Shell Oil Company's PETRECO Desalter at the Tia Juana installation.

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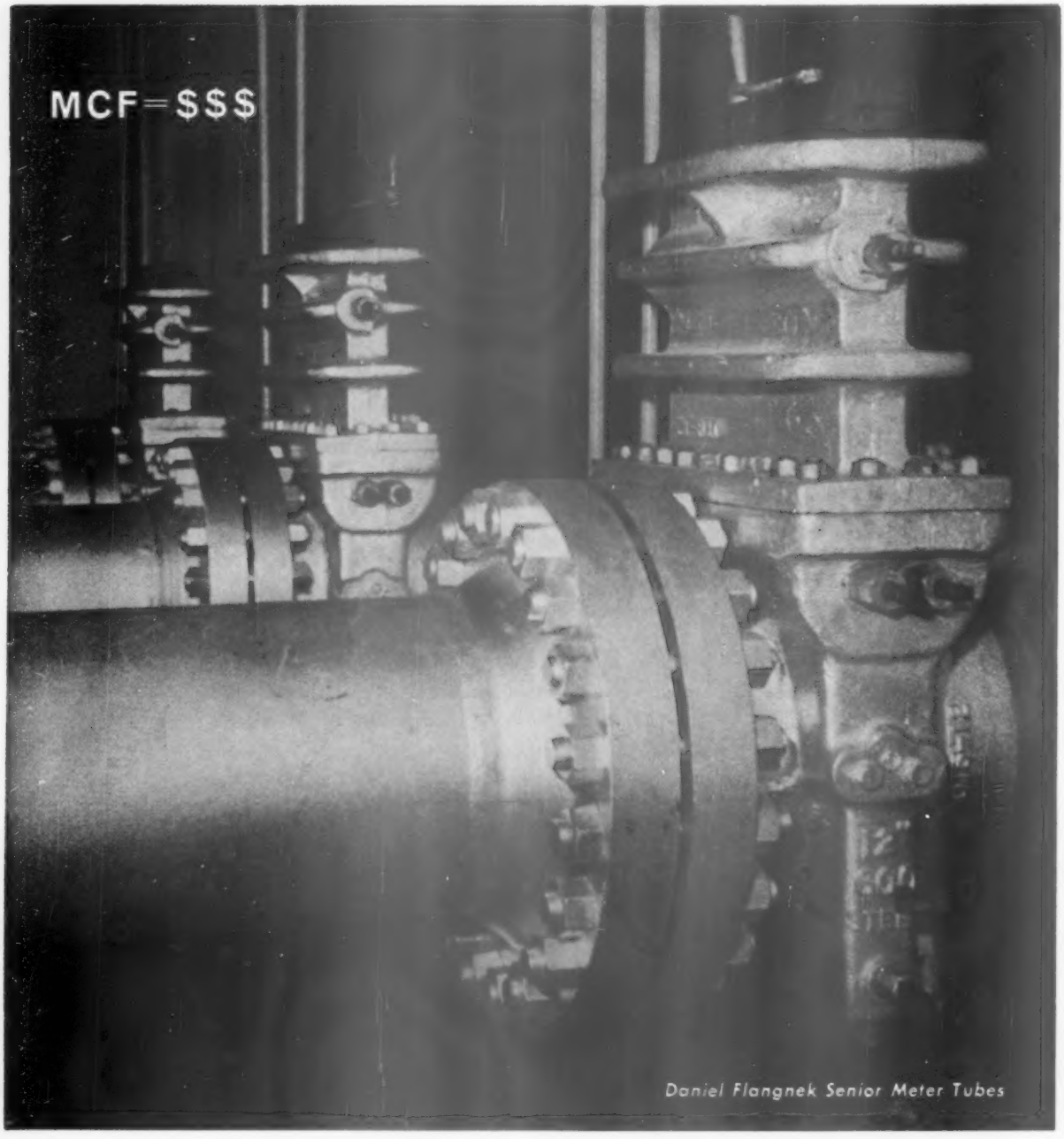

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Natural gas changes hands in a hurry at the orifice meter station. Here is where millions of cubic feet become dollar signs. You expect optimum "cash register" accuracy and performance. You know you'll get just that with Daniel Orifice Fittings and Meter Tubes because they have the closest tolerances and are easiest to operate. Fast delivery, too. In all sizes (2"–36") and pressure ratings (125 lbs.-2500 lbs. ASA), you can depend on Daniel.

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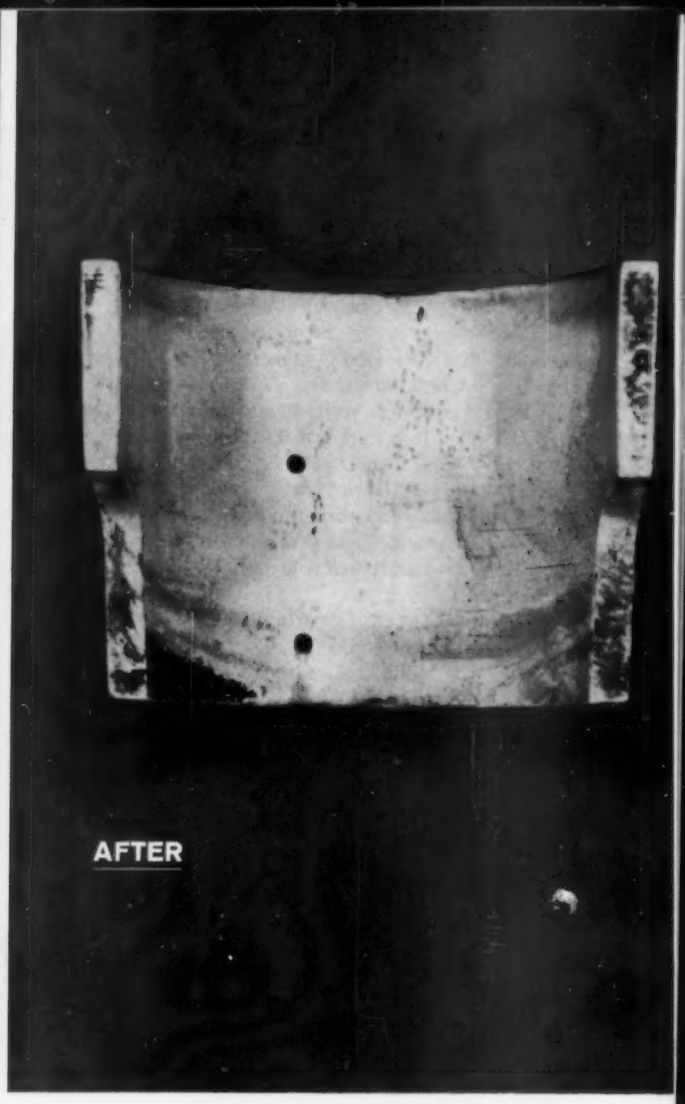

Du Pont's multifunctional additive, DMA-4, cleans carburetors and keeps them clean

Carburetor detergency is a striking example of the performance values you can add to gasolines with Du Pont DMA-4.

The carburetor throat liner you see above illustrates how this additive cleans up power-robbing deposits.

On the left, the liner is coated with residue after exposure to an untreated premium gasoline, under severe test conditions. On the right is the same liner after only two hours additional operation under normal operating conditions using the same gasoline treated with DMA-4 at a concentration of 10 pounds per thousand barrels.

Results of other tests have demonstrated that six pounds of DMA-4 per 1,000 barrels of gasoline will prevent deposit accumulations even under the severe conditions utilized to develop the "before" build-up shown above.

The "clean – keep clean" detergency action of DMA-4 is, however, only one of the performance values offered by this Du Pont additive. DMA-4 also offers:

- **Anti-stalling properties.** DMA-4 sets up a protective film that makes throttle plates and other internal surfaces water repellent, thus preventing stalling due to ice formation on cool, damp days.
- **Rust prevention.** The protective film also protects metal surfaces (engine parts as well as pipelines and storage tanks) from corrosion.
- **Phosphorus credit.** DMA-4 contains phosphorus compounds of the type helpful in suppressing surface ignition and spark plug fouling caused by combustion chamber deposits. The concentration of other phosphorus additives can, therefore, be reduced proportionately to obtain minimum treating costs.

Descriptive Bulletin Available

A product bulletin describing DMA-4 is available. To obtain your copy, and to find out how DMA-4 may add new performance and sales values to your gasolines, contact your Du Pont Petroleum Chemicals Division representative. E. I. du Pont de Nemours & Co. (Inc.), Petroleum Chemicals Division, Wilmington 98, Delaware.

Antiknocks and other Petroleum Additives

Better Things for Better Living . . . *Through* Chemistry DU PONT

THEY SAY

Proves the wrong point

Dear Sir:

I would appreciate knowing whether there is an error in the article "Nonlubricated compressors" by B. J. Chandler in the October 2, 1961, issue of your magazine.

On Page 205 a figure of 0.003 in. of wear with lubrication is compared with 0.005 in. wear with moly rings and no lubrication. This increase in wear is not consistent with the remainder of the article.

T. E. Ross
Research Department
Consolidated
Natural Gas System
Pittsburgh

Reader Ross is right. The figure 0.005 should have been 0.0005.—Ed.

Jargon jars him

Dear Sir:

I am wondering as to whether a Frenchman ever wrote to you to tell you how funny and interesting is your "Journally speaking" piece.

It's all the more funny to me that, being a technical interpreter-translator (in other words, a public relations man with a specialization), I have not to decide whether your articles are right are wrong. To me, "Journally speaking" is like a good humoristic movie. It keeps me happy to see that, in this otherwise serious magazine, there is an article which is by itself a good payout for a subscription.

Recently you published an article on technical vocabulary and its fanciful spelling (OGJ, Aug. 28, p. 33). In my profession, I see quite some strange technical vocabulary with a total lack of uniformity. It varies from one magazine to the other or from one manufacturer to another.

It seems that everyone who develops something or manufactures something gives it its own name, without trying to tie it up to something existing already or already manufactured by somebody else. Hence a terrible mess.

What about an API language committee to put some standardization into that awful mess and lingo? What about some official API glossary covering all pipelines, petro-

The OIL AND GAS JOURNAL

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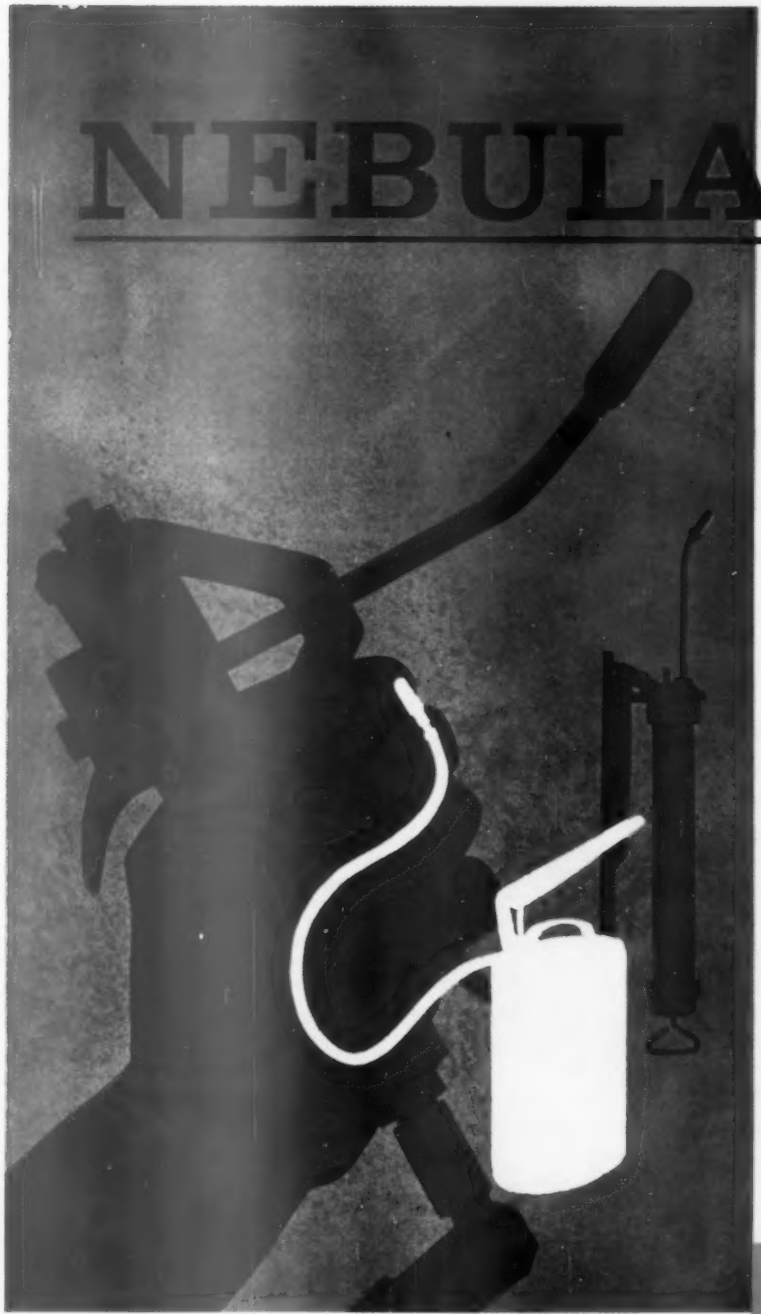

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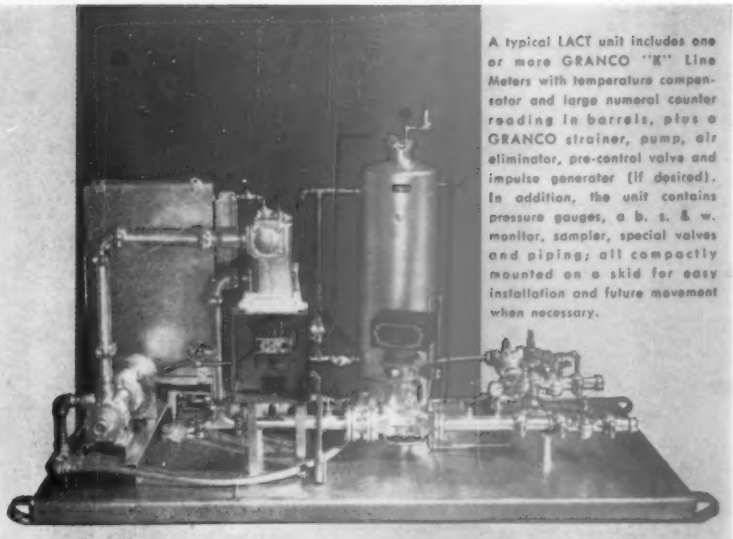

A typical LACT unit includes one or more GRANCO "K" Line Meters with temperature compensator and large numeral counter reading in barrels, plus a GRANCO strainer, pump, air eliminator, pre-control valve and impulse generator (if desired). In addition, the unit contains pressure gauges, a b. s. & w. monitor, sampler, special valves and piping; all compactly mounted on a skid for easy installation and future movement when necessary.

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LACT producers use volume measurement as the basis for dollar evaluation of crude-oil custody transfer. More and more, producers large and small are specifying GRANCO positive displacement metering systems. These modern, 5-blade, rotary type positive displacement meters provide smooth, non-pulsating operation with unparalled accuracy over the complete flow range. Ruggedly constructed and specially designed for LACT operations, they require little or no maintenance.

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leum, petrochemical industries, including equipment and equipment parts? It might be worthwhile making, even for you people, because your own technicians are often ignoring lots of words which do not belong exclusively to their specialization.

Well, keep on the good work; make people smile while they still can do it. This man's world is going plain crazy and it needs men like you to cheer up our poor humanity.

Emile J. Perrussot
Societe Parisienne pour
L'Industrie Electrique
Seine, France

Collars are mistreated

Dear Sir:

The writer wishes to compliment you on the very comprehensive article "How to get your money's worth from drill collars," which appears in the October 2 issue of The Oil and Gas Journal (by H. M. (Moak) Rollins, p. 121).

I don't believe I have ever seen another article published which so intelligently presents attendant problems to tool joint failures. The illustrations are indeed excellent.

Our firm maintains 15 domestic field sales representatives and 30 in foreign fields. We endeavor to get such informative material into their hands as working tools and would desire to send a reprint to each.

Often when an operator has a joint failure, the drill collar salesman hears that "Your joints are no good"; often the lubricant salesman hears "Your dope is no good." Every drilling superintendent, pusher, and driller should have a copy of your article. With techniques perfected today by manufacturers of tools and lubricants, I am convinced that 99% of joint failure is the result of improper handling on the rig floor, improper makeup, etc.—all matters of the human element.

Again, my highest compliments for an excellent job.

D. J. Bergeron
Vice President and
Sales Manager
Jet-Lube, Inc.
Burbank, Calif.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

OCTOBER

23-25 Pennsylvania Grade Crude Oil Association and Pennsylvania State University Mineral Industries Experiment Station, technical conference on oil recovery by solvents, Pennsylvania State University campus, University Park.

24-25 University of Kansas, Southwest Kansas Center, sixth annual natural-gas pipeline institute, Court House, Liberal, Kans.

24-27 National Association of Corrosion Engineers, south-central region conference and exhibition, Shamrock-Hilton Hotel, Houston.

25-26 National Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

25-27 Gulf Coast Association of Geological Societies, annual meeting, Granada Hotel, San Antonio, Tex.

27 Natural Gas Processors Association, southern regional meeting, Carlton Hotel, Tyler, Tex.

27 Permian Basin Petroleum Pioneers Day, Midland, Tex.

29-31 Independent Petroleum Association of America, annual meeting, Shamrock-Hilton Hotel, Houston.

29-Nov. 1 National Lubricating Grease Institute, annual meeting, Rice Hotel, Houston.

29-Nov. 10 Northwestern University, Transportation Center, executive seminar on transport costs, prices, and profits, Evanston, Ill.

30-Nov. 1 National Association of Corrosion Engineers, northeast region conference, Hotel Statler, New York.

NOVEMBER

1-3 Southwest Federation of Geological Societies, annual meeting, Hilton Hotel, El Paso, Tex.

2-3 Society of Petroleum Engineers of AIME, annual California regional meeting, Hacienda Motel, Bakersfield, Calif.

2-3 API, annual agriculture-petroleum seminar, Louisiana State University, Baton Rouge.

2-3 Southern Gas Association, research and development roundtable conference, Shreveporter Highway Hotel, Shreveport, La.

2-4 Geological Society of America, annual meeting, Cincinnati, Ohio.

5-9 Society of Exploration Geophysicists, international meeting, Denver.

6-8 Chemical Institute of Canada, conference of the chemical engineering division, Royal York Hotel, Toronto.

8-11 National Oil Jobbers Council, meeting, Morrison Hotel, Chicago.

9-10 Society of Automotive Engineers, national fuels and lubricants meeting, Shamrock-Hilton Hotel, Houston.

13-15 American Petroleum Institute, forty-first annual meeting, Conrad Hilton, Congress and Palmer House hotels, Chicago.

16 Illinois Oil and Gas Association, annual meeting, Mount Vernon, Ill.

17 Natural Gas Processors Association, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

26-Dec. 1 American Society of Mechanical Engineers, winter annual meeting, Statler-Hilton Hotel, New York City.

27-Dec. 1 National Association of Corrosion Engineers, southeast region conference and Florida general conference

Refinery gets crude tower cleaner, faster . . . chemically

Could results as good as 85% clean be made even better in cleaning crude oil deposits from vacuum tower? The Oakite engineer thought so. Here's what he proposed.

For next turnaround, he recommended circulating a solution of Oakite 77 and Oakite Acalaid through the tower. Meanwhile, heat exchangers below were soaked and steamed. Then reversing procedure the solution circulated through the heat exchangers while tower was steamed. This kept up for 15 hours —followed by rinsing and inspection. Results: 99% perfect. In just 21 hours, tower and exchangers were cleaner than they'd ever been.

This job proves again that an *engineered* cleaning program means not only more efficient but also more profitable operations.

*Oakite ECP is a comprehensive cleaning program engineered to fit your particular operation under the experienced supervision of a local Oakite man. ECP covers every cleaning need. For details, write Oakite Products, Inc., 44C Rector Street, New York 6, N. Y.

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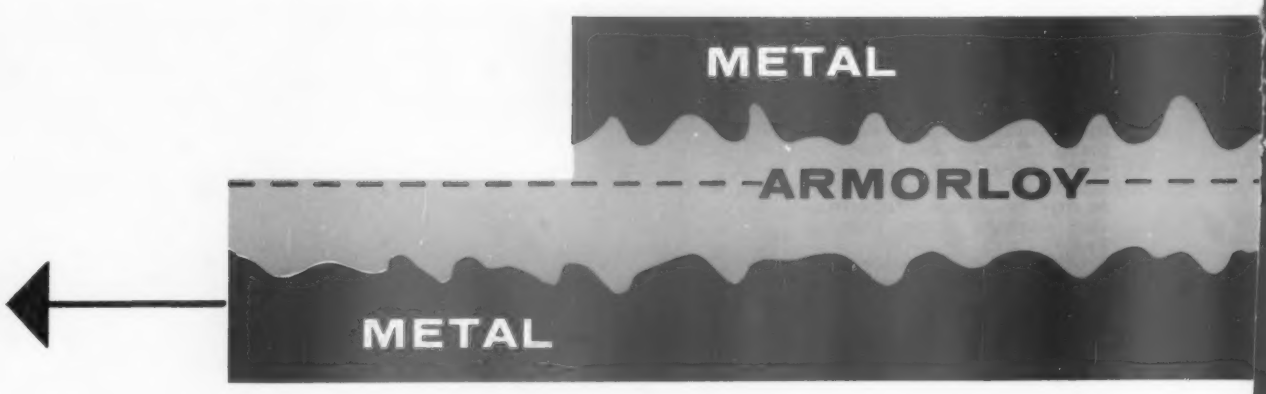
it restores pipeline efficiency through chemical cleaning... it simplifies pump station housekeeping



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Thanks to the introduction of Armorloy — plus important additional changes — A. O. Smith is also proud to announce the *new capacity ratings* for its complete line of line and high pressure meters.

Armorloy is just another step in A. O. Smith's far-reaching design program to make petroleum meters serve your industry better!

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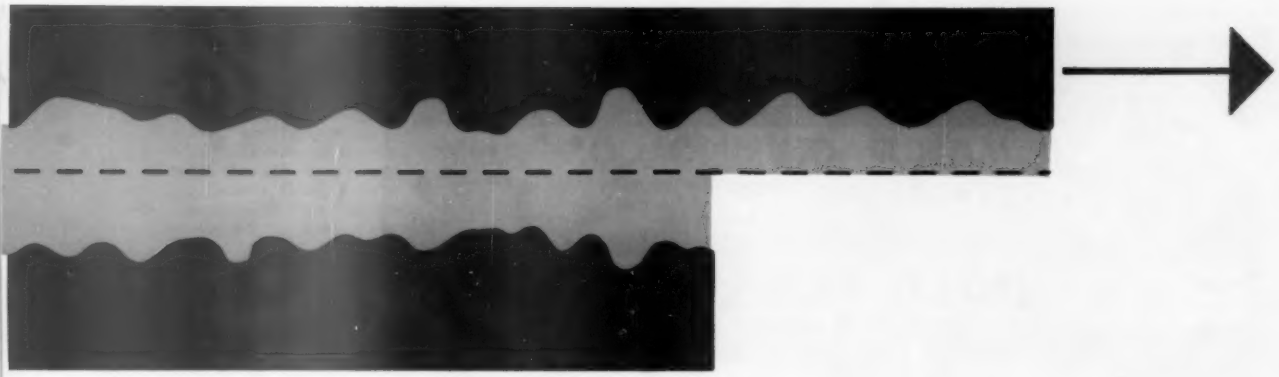

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New Armorloy process helps increase meter capacity as much as 25%

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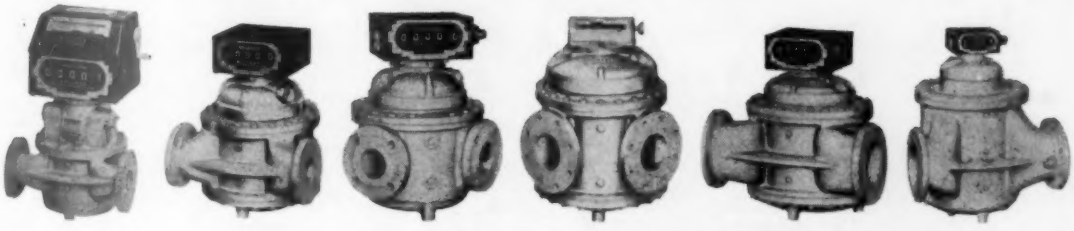


S & B-13 130 GPM

S-28 280 GPM

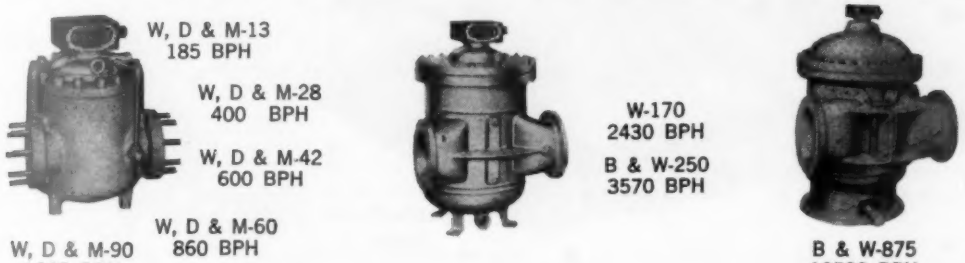
S, AS & AB-42 420 GPM

S, AS & AB-60 600 GPM

S & AB-100 1000 GPM

B-170 1700 GPM

HIGH PRESSURE METERS



W, D & M-13 185 BPH

W, D & M-28 400 BPH

W, D & M-42 600 BPH

W, D & M-60 860 BPH

W, D & M-90 1285 BPH

W-170 2430 BPH

B & W-250 3570 BPH

B & W-875 12500 BPH

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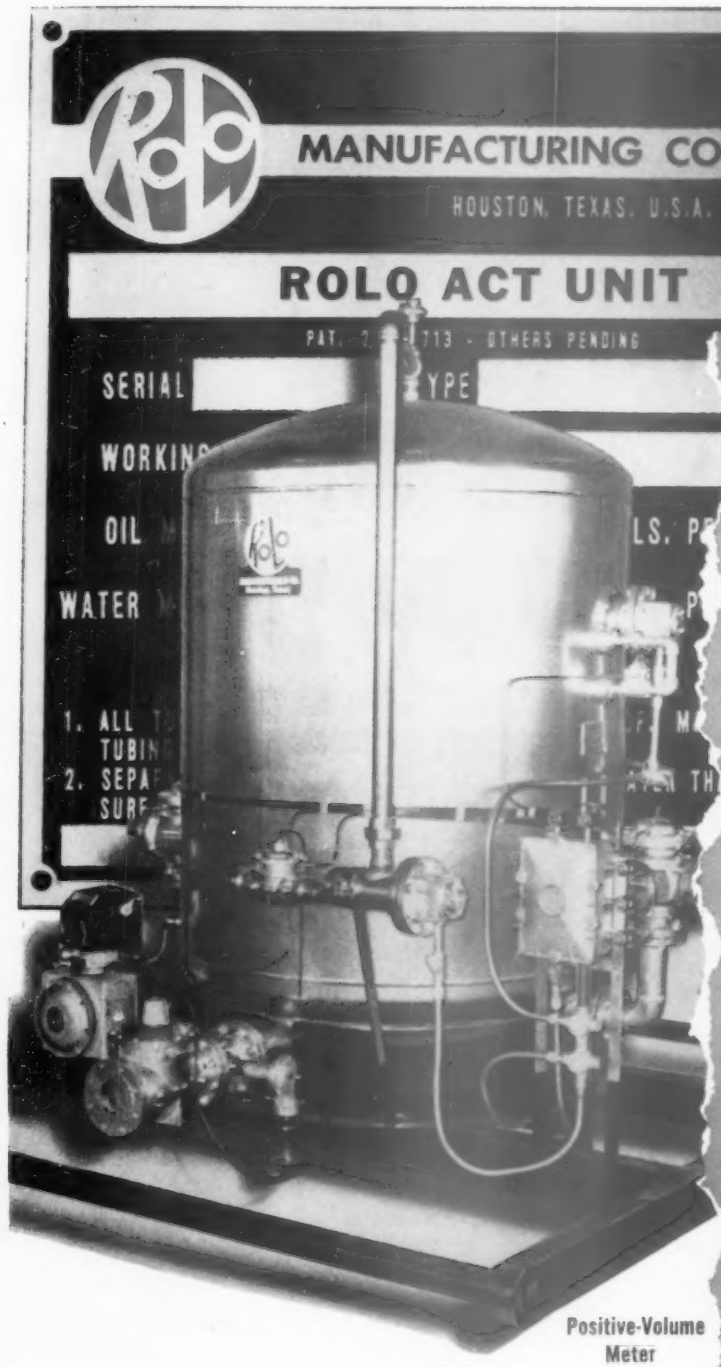
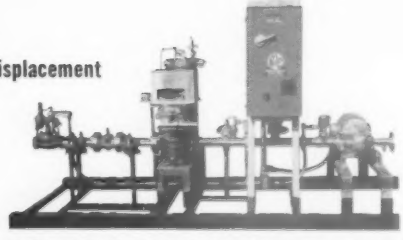


Positive-Volume Meter



Positive-Displacement Meter

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The ROLO emblem

on ACT systems promises you accuracy and dependability

Rolo automatic custody transfer systems are guaranteed to meet all standards for accuracy and dependability. They are available in both positive-volume (dump type) and positive-displacement types. These units do not lose pump suction, and they do not allow gas to be blown down the line during pressure operation.

Positive-volume systems can be provided with electric, pneumatic or electropneumatic controls. An exclusive, reliable temperature compensator keeps their accuracy high. Paraffin deposits are prevented by plastic coatings inside metering chambers. Both single - chamber and dual - chamber models are available.

Rolo ACT systems can be supplied in sizes to handle all flow rates. Individual ACT meters or complete packaged systems can be provided. Complete systems can include ticket printers, cut monitors, samplers, pumps, and other accessories.

For detailed specifications on Rolo ACT systems, see your Rolo representative, or write to us at the address below.

short course, Key Biscayne Hotel, Miami.

DECEMBER

3-6 American Institute of Chemical Engineers, annual meeting, New Yorker Hotel, New York City.
4 AIME's Society of Petroleum Engineers, Arizona section, annual meeting, Pioneer Hotel, Tucson.
4-6 Interstate Oil Compact Commission, annual meeting, Denver Hilton Hotel, Denver.
5-6 National Petroleum Refiners Association, computer conference for refiners, Hotel Tulsa, Tulsa.

JANUARY

7-10 Pipe Line Contractors Association, annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.
8-12 Society of Automotive Engineers, annual meeting, Cobo Hall, Detroit.
16-18 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville, Ky.
17-19 National Association of Corrosion Engineers, Canadian region eastern division conference, King Edward Hotel, Toronto.
19 Natural Gas Processors Association, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.
24-26 American Society of Mechanical Engineers, second symposium on thermophysical properties, Princeton University, Princeton, N. J.
31-Feb. 1 National Petroleum Refiners Association, Gulf Coast regional meeting, Ben Milam Hotel, Houston.

FEBRUARY

4-7 American Institute of Chemical Engineers, national meeting, Statler Hotel, Los Angeles.
14-17 Pipe Line Contractors Association of Canada, Castle Harbor Hotel, Bermuda.
15-17 Southwestern Legal Foundation, annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.
16 Natural Gas Processors Association, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette.
18-22 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, New York City.
22 Chemical Institute of Canada, protective coatings division, Seaway Hotel, Toronto.
23 Chemical Institute of Canada, protective coatings division, Windsor Hotel, Montreal.
27-Mar. 2 International Oil and Gas Educational Center, institute on economics of the gas industry, Southwestern Legal Center, Dallas.
28-Mar. 2 American Petroleum Institute, Division of Production, southern district meeting, Rice Hotel, Houston.

MARCH

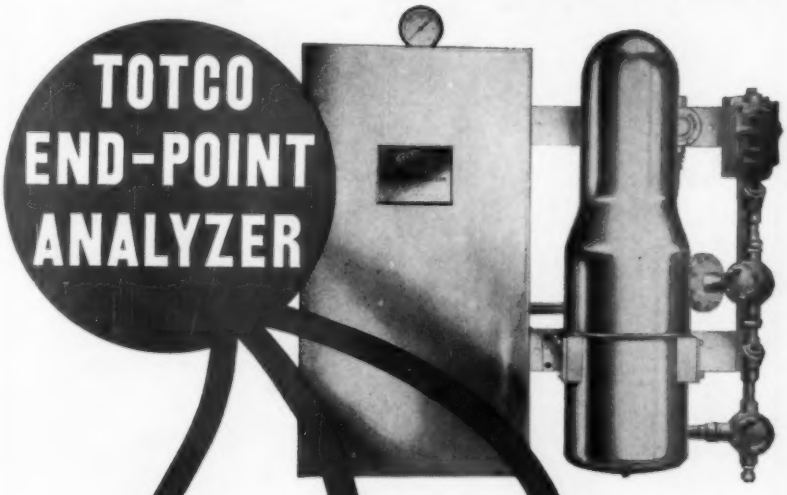
2 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.
4-8 American Society of Mechanical Engineers, gas turbine-process industries conference, Shamrock Hilton Hotel, Houston.
6-7 National Petroleum Refiners Association, eastern regional meeting, Sheraton-Cleveland Hotel, Cleveland.
15-16 Society of Petroleum Engineers of AIME, economics and valuation symposium, Dallas.
16 Natural Gas Processors Association, Oklahoma regional meeting, Sheraton-Oklahoma Hotel, Oklahoma City.
19-22 Kentucky Petroleum Marketers Association, management institute conducted by the University of Louisville, Brown Hotel, Louisville, Ky.
21-23 New England Gas Association, annual meeting, Statler-Hilton Hotel, Boston.
21-23 American Petroleum Institute, Division of Production, southwestern district meeting, Lincoln Hotel, Odessa, Tex.
26-29 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, joint annual meeting, Fairmont Hotel, Civic Auditorium, San Francisco.
27-29 American Society of Mechanical Engineers, power conference, Sherman Hotel, Chicago.

APRIL

2-4 National Petroleum Refiners Association, annual meeting, Granada Hotel, San Antonio.
3 Chemical Institute of Canada, chemical economics division conference, Royal York Hotel, Toronto.
4-6 API, Division of Production, Mid-Continent district meeting, Sheraton Oklahoma Hotel, Oklahoma City.
5-6 Society of Petroleum Engineers of AIME, upper Gulf Coast region, drilling and production practices conference, Beaumont, Tex.
9-10 Instrument Society of America, national chemical and petroleum instrumentation symposium, Wilmington, Del.
9-11 Mid-West Gas Association, annual meeting, Hotel Radisson, Minneapolis.
9-12 National Oil Fuel Institute, national

now on-stream

TOTCO END-POINT ANALYZER



optimum returns through quality control

Among companies now using one or more Analyzers for monitoring or controlling are:

The Atlantic Refining Company
Gulf Oil Corporation
Mobil Oil Company
Richfield Oil Corporation
Standard Oil Company of Calif.
The Standard Oil Company of Ohio
Sun Oil Company
Texaco, Inc.
Texas City Refining, Inc.
Tidewater Oil Company
Wilshire Oil Company of California
and many other leading firms.

Applications include quality control of reformer feed, gasoline and distillate components, and "special" products.

Permits closer control to end-point specifications and increased yield. Continuous analysis improves quality. Write for Bulletin 6000-11.

Totco also makes an Initial Boiling Point Analyzer. Write for Bulletin 1259-11.

MANUFACTURERS OF PRECISION INSTRUMENTS SINCE 1929

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TECHNICAL OIL TOOL CORPORATION
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2 great newcomers by Pacific that welcome tough assignments ...

1

New **BTV VALVES with** ***Dual*** **seating design for absolute shut-offs.**

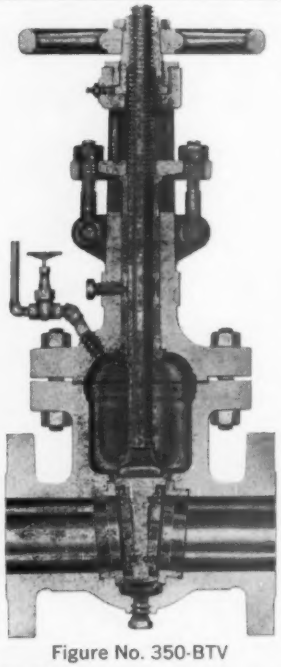

Figure No. 350-BTV

PACIFIC's Block & Bleed Gate Valves seal tightly on **BOTH** sides of the wedge. Positive visual proof of seat tightness is possible by first draining the body cavity and then connecting to the bonnet tap a pressure gage, manometer or a simple drain into a glass graduate. The primary seal in the wedge is Viton-A or PACIFIC's "Resist-Seal"; secondary seal is metal to metal for fire safe protection. Available in 150 Lb. and 300 Lb. Series.

Let PACIFIC show you how these valves better serve you ... Write for Pacific's Block & Bleed Bulletin BV-2.

2

New **BALL VALVES with** ***Exclusive*** **adjustable compression ring sealing**

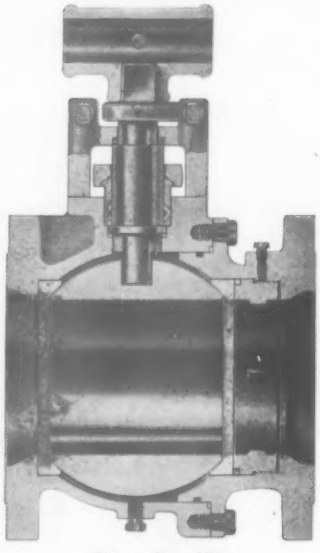

Figure No. 400

PACIFIC's NEW line of Ball Valves are available in the following sizes:

Screwed Ends ..... ¼" to 2"

Flanged Ends ..... 2½" to 14"

Standard materials: Cast Iron, Ductile Iron, Aluminum, Bronze, Carbon Steel CF8, CF8M, Alloy 20 and Monel.

Standard seal materials: Buna-N, Neoprene, Viton A, Teflon, Kel-F and Nylon. Special seal materials: Silicone rubber, Rulon and Fluorogreen.

Check the many exclusive features offered, to be found in PACIFIC's line of Ball Valves. Write for Bulletin BV-60.

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Sales Offices in Most Principal Cities with Complete Valve Reconditioning Facilities in Houston, Texas; Woodbury, New Jersey; and Chicago, Illinois.

oil heat and air conditioning exposition, Chicago.

11-12 Petroleum Industry Electrical Association and Petroleum Electric Supply Association, convention and exposition, Dallas.

11-13 API, Division of Production, Rocky Mountain district meeting, Hilton Hotel, Denver.

12-13 Society of Petroleum Engineers of AIME, production research symposium, Tulsa.

14-18 Petroleum Equipment Suppliers Association, annual meeting, Boca Raton Hotel, Boca Raton, Fla.

15-18 American Society of Mechanical Engineers, oil and gas power division conference, Shoreham Hotel, Washington.

17 Society of Plastics Engineers, Philadelphia section, regional technical conference, Sheraton Hotel, Philadelphia.

17-19 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

17-19 American Society for Metals, regional conference and exhibition, materials and materials processing for the petroleum, petrochemical and chemical industries, Shamrock Hilton Hotel, Houston.

23-25 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Salt Lake City.

24-26 American Society of Mechanical Engineers, production engineering conference, Van Curler Hotel, Schenectady, N. Y.

25-27 Natural Gas Processors Association annual convention, Hilton Hotel, Denver.

29-May 1 Independent Petroleum Association of America, midyear meeting, Hotel Muehlebach, Kansas City.

29-May 1 Empire State Petroleum Association, spring convention, Statler-Hilton Hotel, Buffalo, N. Y.

29-May 2 Liquefied Petroleum Gas Association, annual convention and trade show, Conrad Hilton Hotel, Chicago.

29-May 2 Southern Gas Association, annual meeting, and American Gas Association, transmission conference, Rice Hotel, Houston.

30-May 2 API, Division of Transportation, annual tanker conference, Del Monte Lodge, Pebble Beach, Calif.

MAY

2-4 API, Division of Finance and Accounting, midyear meeting, Americana Hotel, Bal Harbor, Fla.

4 Chemical Institute of Canada, rubber chemistry division, Niagara Falls, Ont.

7-8 Society of Petroleum Engineers of AIME, North Texas section, fifth biennial secondary recovery symposium, Wichita Falls, Tex.

7-8 American Society of Mechanical Engineers, maintenance and plant engineering conference, Royal Orleans Hotel, New Orleans.

10-11 API, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

11 Natural Gas Processors Association, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

11-12 Kansas Independent Oil and Gas Association, annual meeting, Broadview Hotel, Wichita.

14-17 API, Division of Refining, midyear meeting, Fairmont and Mark Hopkins Hotels, San Francisco.

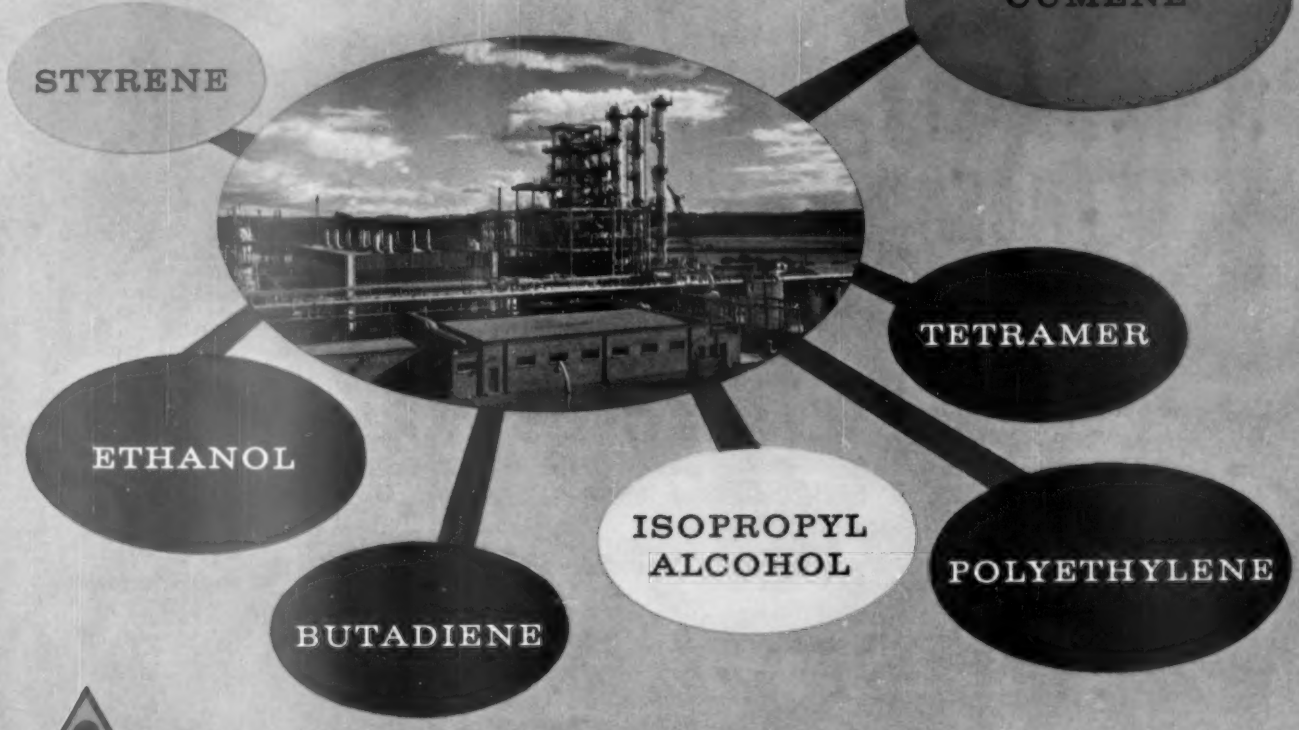
STONE & WEBSTER CREATES

reliability at the core of the COMPLEX....

Petrochemical complexes depend on a reliable and efficient supply of pure ethylene and other intermediate chemical feedstocks produced in ethylene plants. Stone & Webster has developed and constructed such plants in the United Kingdom, Japan, Germany, France, Denmark, Holland and Italy, as well as the United States. In all, Stone & Webster has designed and built 37 ethylene plants in 12 countries with an annual capacity of 3.2 billion pounds.

In addition to reliable ethylene plants, Stone & Webster has developed advanced designs, and built ethanol, ethylene oxide, polyethylene, styrene, cumene, tetramer, isopropyl alcohol, butadiene and other satellite plants in the petrochemical complex.

Our specialized ability and experience are available to you. We would welcome an opportunity to discuss your next project.



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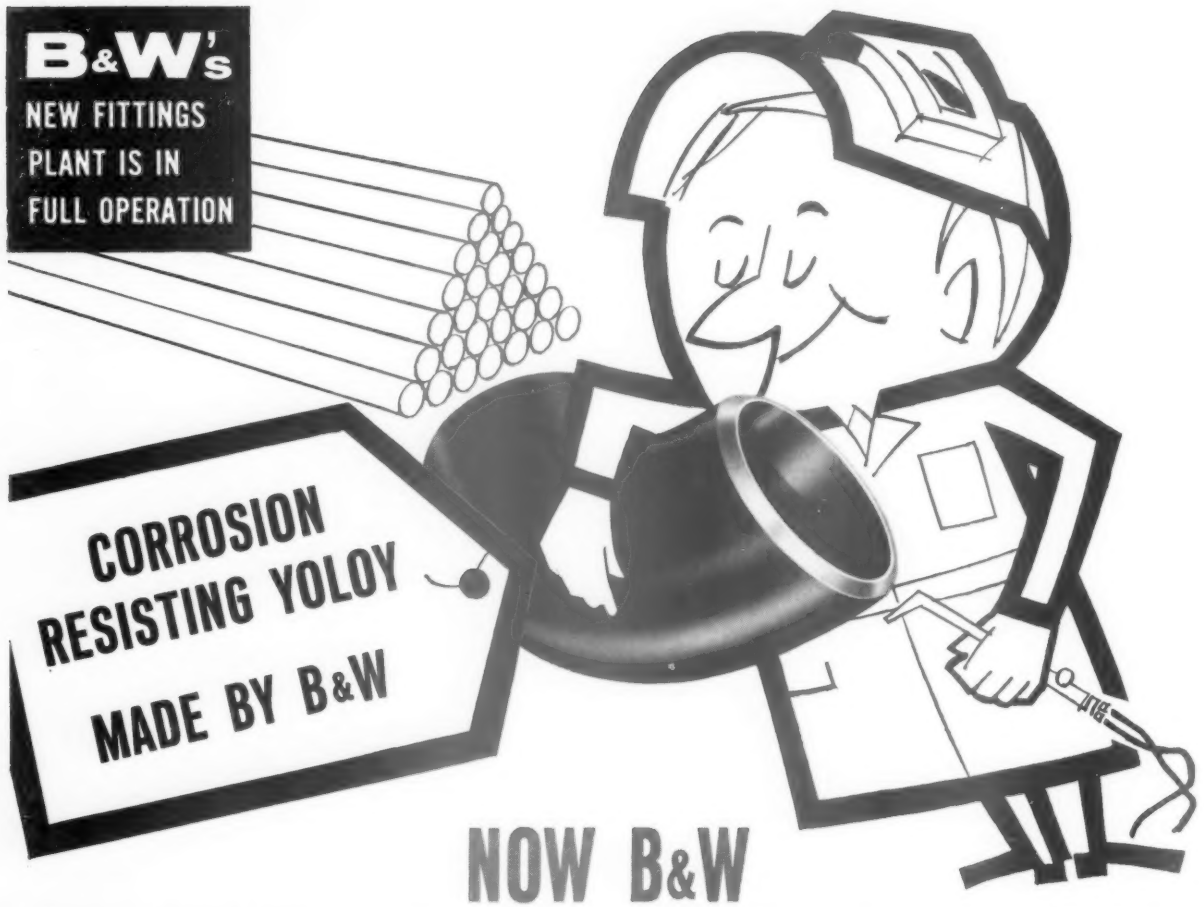


NOW B&W CAN SUPPLY A FULL LINE OF FITTINGS & FLANGES FOR YOLOY PIPING SYSTEMS

The Tubular Products Division of The Babcock & Wilcox Company has been licensed by The Youngstown Sheet and Tube Company to manufacture and sell welding fittings of Yoloy. This is the alloy steel piping material that resists corrosion better than wrought iron . . . at less cost than wrought iron.

B&W, with integrated facilities for steel and tube-making, tied-in with the new welding fittings operation is the only manufacturer in the industry in position to produce a comprehensive range of types and sizes of fittings and flanges of Yoloy. If you are planning a piping system for resistance to atmospheric, soil or chemical corrosion, you can now have a job-matched system . . . all Yoloy steel . . . and save money in the bargain.

Ample stocks of Yoloy fittings and flanges are available through any B&W Welding Fittings Distributor. For further information on B&W fittings and flanges of corrosion-resistant Yoloy, consult your local B&W District Sales Office and ask for B&W Bulletin TF-512. The Babcock & Wilcox Company, Tubular Products Division, Fittings Plant, P. O. Box 230, Beaver Falls, Pennsylvania.

B&W THE BABCOCK & WILCOX COMPANY

TA-1040F

TUBULAR PRODUCTS DIVISION

Seamless and welded tubular products, solid extrusions, rolled rings, seamless welding fittings and forged steel flanges — in carbon, alloy and stainless steels and special metals

THE JOURNAL SAID

50 years ago

October 22, 1911

The council of the Osage Indian tribe at Pawhuska, Okla., approves the opening of more than 50,000 acres of land in the Osage Nation for leasing and oil and gas development. The land is in addition to that covered by the Foster blanket lease.

Madagascar Oil Development Co., Ltd., a British enterprise, reports the discovery of oil on the island of Madagascar, off the coast of Africa. The oil was found in a 550-ft. sand. The discovery well is 7 miles southwest of Folakara, in the Sakalava Valley. It is the third drilling venture by the company on this island.

England's long drawn-out war of oil marketers comes to an end. At one time during the price-cutting spree, kerosine sold as low as 2¼ pence per gallon, barely covering transportation and administration costs.

25 years ago

October 22, 1936

Daily average crude-oil production the past week climbed to a new all-time high level of 3,079,874 bbl., an increase of 50,281 bbl. over the previous week. Oklahoma accounted for much of the increase with a jump of 23,350 bbl. in its daily output.

Directors of Tide Water Associated Oil Co. and Tide Water Oil Co. approve an agreement for merging these companies and Associated Oil Co. into a new Tide Water Associated Oil Co. The present Tide Water Associated owns 99.13% of the capital stock of Tide Water Oil Co., and 98.21% of Associated Oil Co.

10 years ago

October 25, 1951

The world's largest fluid catalytic cracking unit goes on stream at Gulf Oil Corp.'s Port Arthur, Tex., refinery. The new 63,000-bbl. unit has a throughput capacity 20% greater than any other such unit in operation.

Special ceremonies mark dedication of new Snyder gasoline plant and launching of huge cooperative natural-gas conservation project in Kelly-Snyder field in Scurry County, Texas. Sun ray Oil Corp., plant operator for 30 companies and 60 individuals associated in the project, is host at open house for new $8,000,000 plant.

JOURNALLY SPEAKING

Rank complaint

AT THE "STRAYS" table at the Petroleum Club, where the oil industry is dissected and all the world's problems are solved every noon, one fellow (a production man) was bemoaning the low estate to which the producing end of the business has fallen.

"It used to be," he said, "that production was the cock o' the walk, the queen bee of the industry. The man who could get out the crude oil was the big cheese in every company. Now production is just a stepchild. Marketing is the thing now.

"The highest-ranking division in the industry today is marketing. No. 2 would be tax and finance, followed by refining and exploration in that order, and with production way down at the very bottom. You'll find that just about every company ranks its people in that order of importance. The ranking used to be just exactly the reverse.

"The marketing men have taken over the business, and the marketing division is the tail that wags the dog in every oil company today."

There were no marketing men at the table that day (they probably were all at the more exclusive Tulsa Club where they don't have to associate with such peons as producers, geologists, and drilling contractors who eat at the Petroleum Club) so everybody agreed with this estimate that marketers now have top rank in the oil business.

"Why, I can remember," said one, "when we used to look down our noses at our marketing department. We didn't even consider them oil men. Same way with our finance people. They were all off in a side room somewhere, and nobody paid much attention to them. We were after production, and our top officials were all exploration and production men. But today most of our top executives came up through the marketing or accounting departments. Times sure have changed."

"Same way in my company," said another. "Everything's upside down. Our production department used to call the tune. Now somebody else sets the policies and we just take orders."

"I agree," said a thoughtful man across the table, "but I'm not sure that it's all for the best. Maybe our old-time oil executives, who worked their way up from roughnecks, didn't know all they might have known about cost accounting or about running filling stations, but, by golly, they knew how to get things done. They built good, strong companies, and the oil business seemed to do all right under them.

"Now you take this present crop of bright young executives. They've all been to Harvard School of Business Administration or something, and they know all the latest theories about motivation research and corporate organization and all that stuff, but are they real oil men?

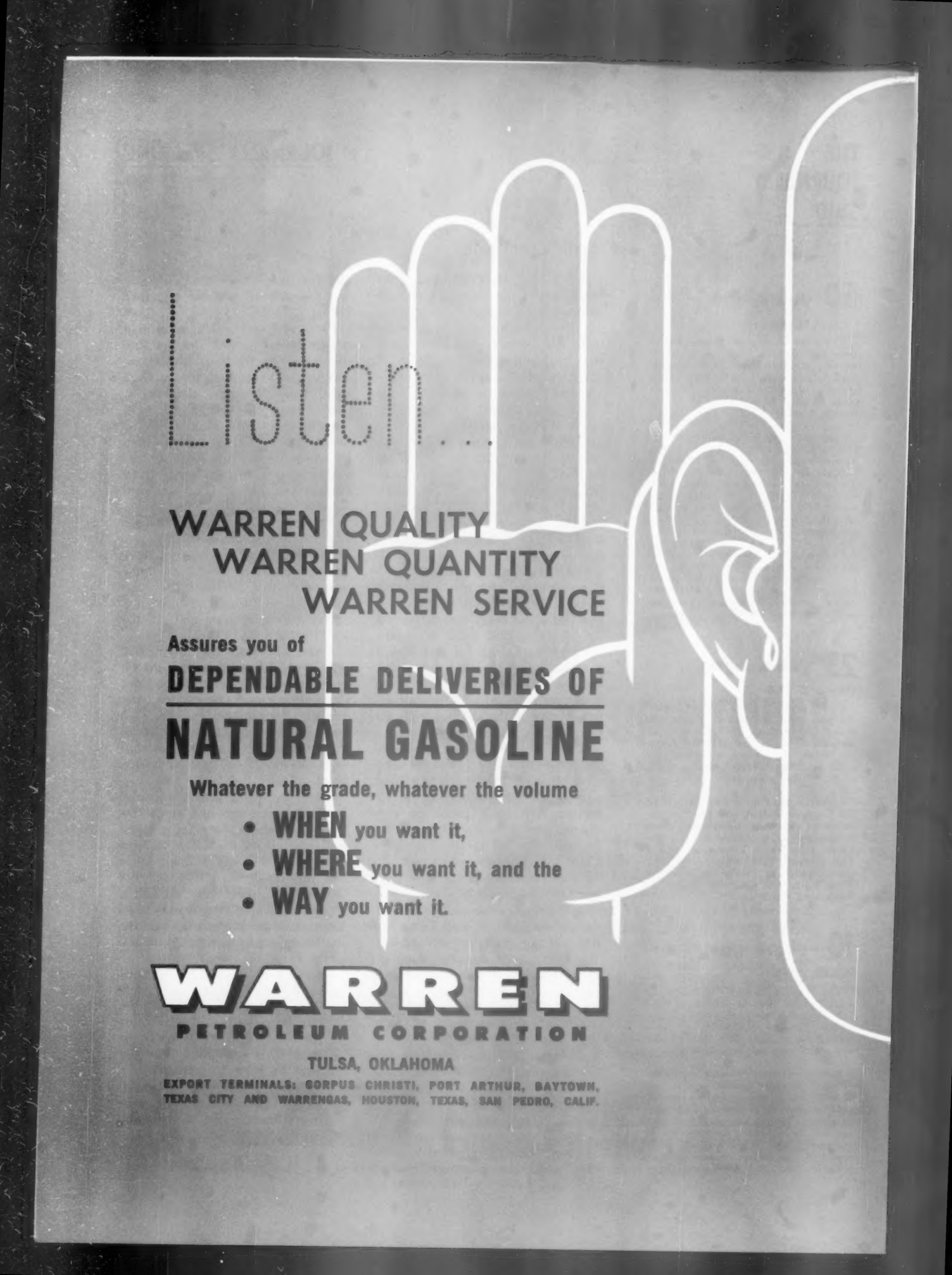
"And where are they taking the oil business? I can't see that the oil business is in any better shape since these management experts took over. In fact, the oil business seems to be going downhill fast. I've never known morale to be so low, at least in our land and exploration department.

"And as for markets, why, we've had more price wars and we get less for our products since the marketing experts took over than we ever did before. I admit I don't know anything about marketing, but I'm wondering if these guys do either. I can't see that our company's marketing is a bit better off since the marketing department got to the top of the heap.

"I just wonder what the oil business will be like in a few years when it's run by business-administration experts instead of guys who came up from the field. It's going to be different, that's for sure, but I'm not sure it's going to be better."

There being no dissent, the meeting adjourned and the lunchers went back to their humble, low-ranking jobs of finding and producing oil.

—Henry D. Ralph.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What's wrong with marketing—No. 3

WHEN DETROIT PUT AMERICA on wheels it presented oil with a seemingly insatiable demand, the like of which few industries ever experienced.

For 40 years refiners were preoccupied with producing more and better gasoline. That seemed to be all that their customers wanted, so few refiners paid much attention to marketing.

Today the needs and desires of the gasoline market have changed, but refiners have not changed their orientation. They are still so preoccupied with their product that they have failed to notice their customer.

QUALITY IMPROVEMENT has reached its limit as a means of expanding sales, at least for the moment. Much gasoline is already of higher quality than many cars need, all refiners can make good gasoline, and the public discounts most claims of individual brand superiority.

Today's motorists show a tendency to prefer the economy grades of gasoline and to ignore the prestige and the services of nationally known marketers. Yet the old-line majors cling to the notion that the entire public wants and will pay for a superior product, a prestige brand name, and a "full-service" filling station.

Throughout the country big market gains have been made by distributors of little-advertised gasoline of a quality that most motorists consider good enough, at a price under the big-name brands. For the most part their stations are designed to give a quick fill-up only, without the services and amenities offered by the majors. They seem to have sensed, and profited from, a change in consumer desires.

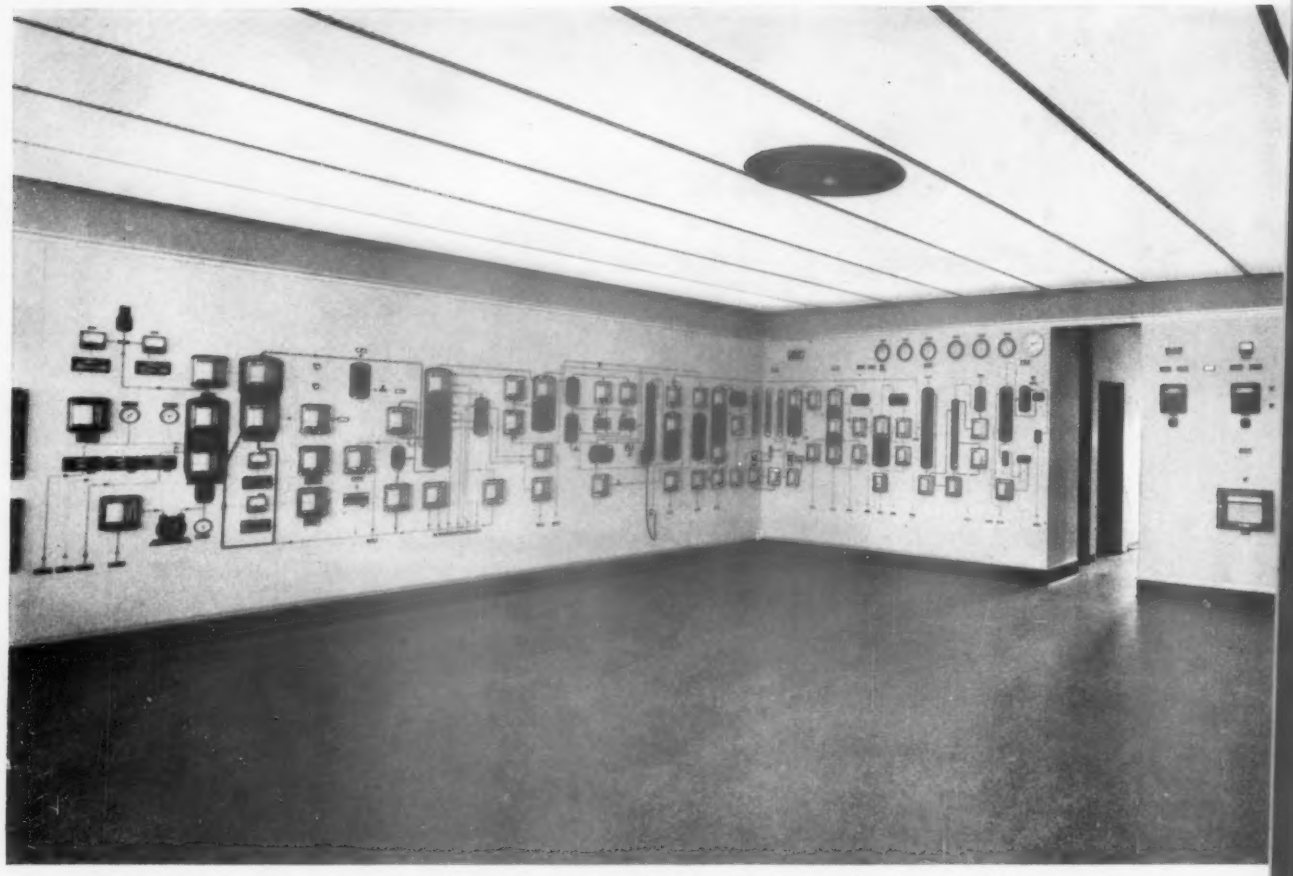
The product-oriented refiners consider this growth of the independents as an affront, a destruction of things-as-they-ought-to-be, and a trend that must be reversed for the good of the consumer and for the cause of product improvement.

So the underlying causes of all the current price warring, market raiding, and station overbuilding are the psychological phenomena of growth mania, preference for low-unit-cost volume over high-unit profit, and an infatuation with one's own product and method of distribution that precludes objective consideration of market realities and changing habits of consumers.

TO PREVENT CHANGE and to preserve obsolescent marketing concepts, some old-line companies use price cuts to combat minor-brand dealers who have hit upon station locations, service patterns, and product price-quality combinations that have attracted customers.

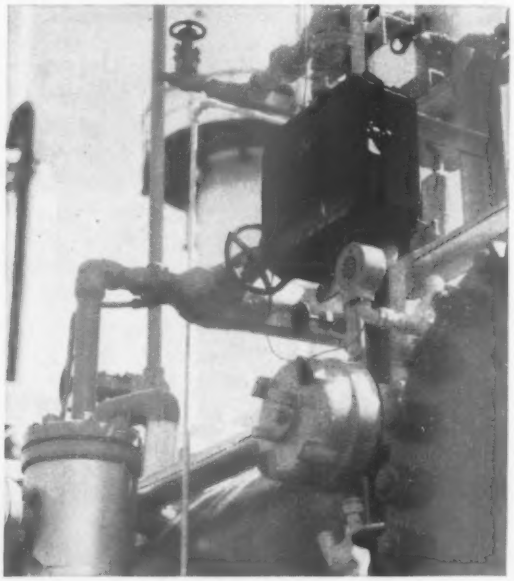
Others, of split personality or uncertain of the trend, imitate the minors with dual brands while retaining old methods with their old brands.

What is needed is new thinking about marketing by top industry executives—the subject of the final editorial in this series.



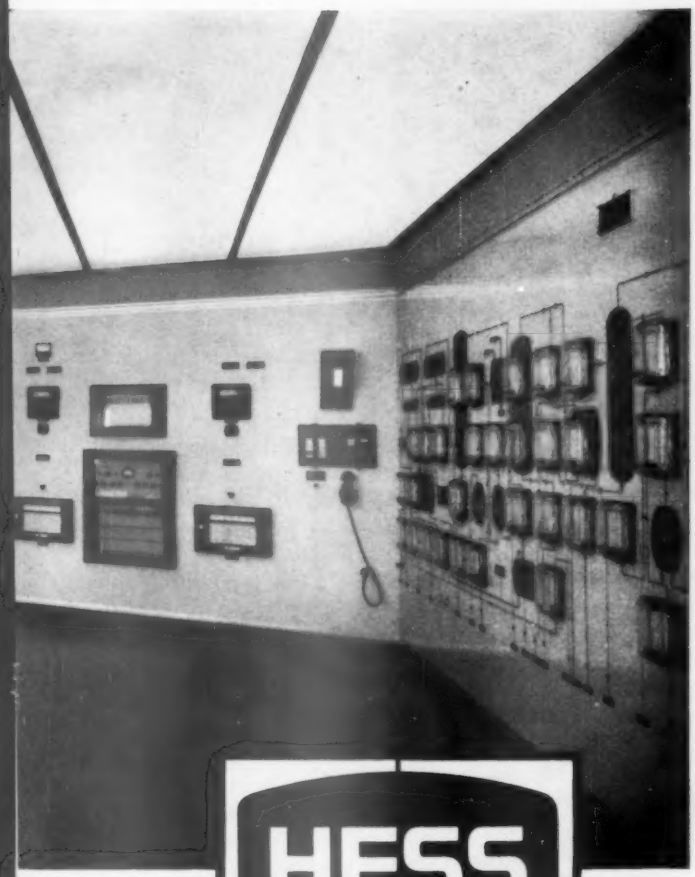
Taylor-built graphic panel at the new Hess refinery at Port Reading, New Jersey, showing some of the many 700 series TRANSCOPE® Recording Receivers and Controllers.

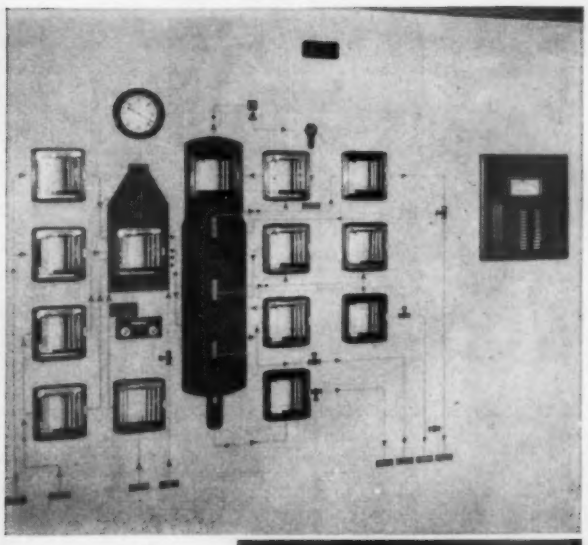
Fluid catalytic cracker section of main panel.



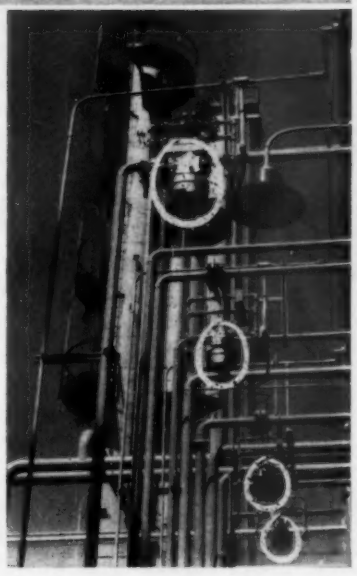
One of the many Taylor TRANSCOPE 726T series pressure transmitters.

Taylor Instruments





Control panel for vacuum crude unit is located in a separate room remote from main control panel.



Four of the Taylor TRANSCOPE 707 series flow transmitters on the alkylation unit.

HESS

CHOSE

TAYLOR FOR ELECTRONIC SUPERIORITY!

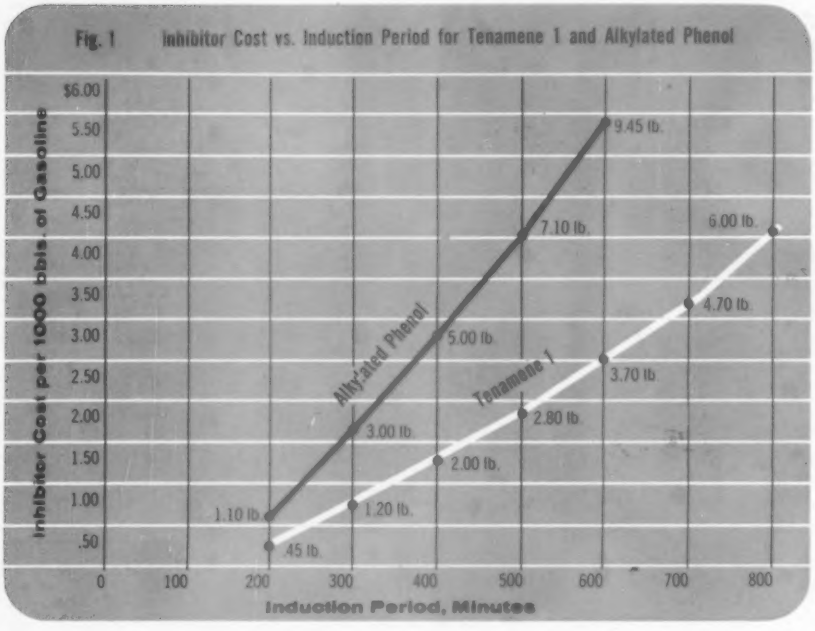
In selecting electronic controls for their ultra-modern refinery at Port Reading, N. J., Hess Inc. based their decision principally on four factors:

- *The quality of the instruments*
- *Systems capability of the supplier*
- *Supplier know-how in refinery applications*
- *Ability to deliver on time*

Based on these considerations Hess chose Taylor

The units, designed by U O P and engineered and constructed by Procon Incorporated employ more than 100 Taylor control loops. These include systems for the vacuum crude units, the fluid catalytic cracker, the gas concentration plant, the alkylation unit and various other treating units. Hess operating personnel were very pleased with the ease of start-up and subsequent on-stream performance of the instrumentation. For information on a Taylor electronic control system for your plant see your Taylor Field Engineer or write for **Bulletin 98335.** Taylor Instrument Companies, Rochester, N.Y., or Toronto, Ont.

MEAN ACCURACY FIRST



Gum inhibitor costs getting too high? Tenamene 1 keeps them down —without sacrificing gasoline stability

When you come right down to stability vs. cost, Tenamene 1 antioxidant at 69 cents a pound is often the least expensive gum inhibitor for many unsaturated, thermally or catalytically cracked stocks.

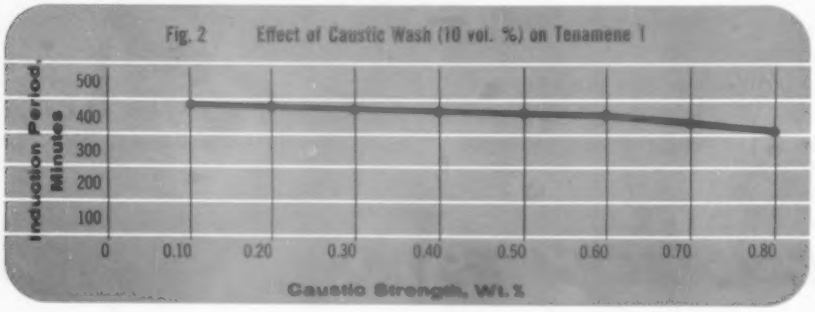
Compared with alkylated phenol inhibitors for instance, Tenamene 1 —an aminophenol in isopropyl alcohol—offers refiners considerably lower treating costs because of its higher potency. Fig. 1 indicates the savings possible in a leaded premium gasoline recently tested, even though the alkylated phenol (flake) inhibitor is priced at 57 cents a pound.

Although Tenamene 1 is caustic-soluble, this becomes a factor only when the inhibited gasoline is in contact with a solution exceeding 0.4% caustic. Most refiners who guard against caustic entrainment have no trouble in this respect. The effect of caustic concentration on induction period is indicated in Fig. 2.

Detailed performance data on Tenamene inhibitors can be quickly obtained through an Eastman representative. Call any of the sales offices listed here, or write EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

Tenamene® 1
an Eastman gasoline additive

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; Atlanta; Boston; Buffalo; Chicago; Cincinnati; Cleveland; Detroit; Greensboro, N. C.; Houston; Kansas City, Mo.; New York City; Philadelphia; St. Louis. **Western Sales Representative: Wilson & Geo. Meyer & Company,** San Francisco; Denver; Los Angeles; Phoenix; Salt Lake City; Seattle.



Danger in Mid-Continent

How crude prices look now

FEELING among crude analysts over the ultimate fate of crude prices boils down to this:

Adjustments of price inequities within areas have just about run their course. Nearly all have been made with the possible exception of West Texas where sour crude still is sold on at least three different schedules.

New cuts which appear in the future will be significant enough to trigger an eventual downward movement.

The real trouble spot is in the Mid-Continent where crude is under pressure from lowered postings in the Denver-Julesburg basin and from weak gasoline prices.

Slowdown. It's been more than a week since a price cut of any significance has occurred.

Crude buyers have not yet spread price cuts outside the Denver-Julesburg basin or fields tied closely to the East Texas region.

Protests of state producer associations in Texas and Kansas and the IPAA in Washington plus hold-the-line stands by at least two majors probably slowed up any more price cutting temporarily.

But other companies still have their price schedules under study, and the economics of their own crude position will determine what they do next.

Only two minor price changes were made last week. American Liberty Pipe Line Co. increased its postings 10 cents to a $2.70 top on 2,470 bbl. daily it buys in Titus County, Texas. This meets an increase recently made by Humble. Sohio Petroleum cut 3 cents to a $2.92 top on 8,000 bbl. daily it buys in four Mississippi fields.

For several weeks previously, however, buyers have made a series of adjustments — both up and down — in East Texas, parts of Louisiana and Arkansas. This was capped by a 15-cent cut in the Rockies by Pure and Sinclair (OGJ, Oct. 16, p. 57).

The Mid-Continent scene. At least three companies have moved to cut down on the supply of crude and products as one answer to the problem.

Phillips Petroleum Co. announced it will reduce its nominations by 3% for November in every state in which it purchases. The explanation: The industry is entering the fall season with excessive inventories and production should be reduced in every state.

State agencies, however, so far are not moving to cut back production for November at least. Louisiana's November and December allowables were kept at present levels. Texas will produce at the 8-day rate for November. Indications are that Oklahoma will keep the current allowables. In each instance nominations by purchasers were slightly higher for next month.

Vickers Refining Co. of Wichita, Kans., meanwhile, announced its runs will be cut 3,000 bbl. daily immediately. Vickers President J. W. Meehan said the action was taken after a careful study of the refining throughput and inventory balances in Kansas, Missouri, Iowa, and Nebraska.

"The oil industry as a whole must search its soul for the chaotic economic conditions within the industry," he said. "Our company feels that high refinery runs will continue to deteriorate markets which would be detrimental to the public as well as to the companies directly involved."

DX Sunray cut runs by 7,500 bbl. daily at its two Oklahoma refineries and switched yields to emphasize fuel oil rather than gasoline.

DX Sunray President S. D. Breitweiser expressed alarm at the general economic imbalances in the industry, particularly at low wholesale gasoline prices.

Breitweiser said industry crude runs have been unrealistically high for several months and warned that

One depressing factor—weak demand

POOR DEMAND in the first half of the year may be partly responsible for some of current oil industry troubles.

Total demand for that period averaged 9,978,000 bbl. daily compared with 10,051,000 for first half of 1960. That's a decline of about 0.75%.

Third-quarter demand was up about 3.8% over last year. But there's little to cheer about because this gain can be credited to low demand in the third quarter last year. Over-all demand for the first three quarters this year is up only 0.3% over last year.

Canadian producers are faring better. First-half production averaged 612,737 bbl. daily, a gain of 47,104 bbl. daily over last year and only 68 bbl. daily under goals of the national oil policy.

Of this production, 159,251 bbl. daily was exported to U. S. markets, a gain of 39,452 bbl. daily over 1960.

Why Toledo played a major role in recent price cuts

TOLEDO refining market has suddenly been spotlighted as an important competitive crossroads for crude oil.

Oil streams from East Texas, the Illinois basin, Oklahoma, West Texas, the Rocky Mountains, and Canada feed into the area's four refineries.

Gulf has a 44,200-bbl. refinery there, Pure a 38,000-bbl. plant, Sohio one of 54,000 bbl. and Sun has the largest at 95,000 bbl.

These refineries with their pipeline and tanker connections have made Toledo an important crude market available to much of this continent's oil. That's why a change in the price of East Texas crude, for example, sets off a reaction in other crudes wanting to hold a share of the market.

That's why Pure also explained that its reduction of Denver-Julesburg basin crude prices actually was brought on by earlier reductions by others in East Texas. Sun and Sohio move East Texas crude to Toledo over the Mid-Valley Pipe Line. Pure also moves the D-J crude to its plant there and found it too high priced after the East Texas reductions.

After the price changes, here's how the competitive crudes now look when laid down at Toledo refineries:

East Texas $3.392 per barrel, Denver-Julesburg $3.3278, Illinois basin $3.311, Oklahoma sweet $3.5305, and West Texas intermediate sweet $3.5001. Prices for Canadian crude vary with the source, but they are reported as much as 50 cents lower than U. S. crudes laid down to Great Lakes refiners.

The new prices immediately show the disadvantage that Oklahoma and West Texas crudes now hold in this market.

continued excessive runs could result only in further deterioration of gasoline markets.

Another refining executive in the area, however, pointed out that restrictions on plant throughput are only one aspect of the problem. He declared the industry must find some way to restore stable gasoline markets in the region. He added that all the price wars are not caused by high runs or inventories.

One marketer told the Journal that the only way to stabilize Mid-Continent products markets and avert an ultimate crude-price cut is for refiners to refuse to sell at below cost. He said a price-war in Oklahoma has hung on because of one supplier's insistence for only a 1-cent margin between gasoline prices of majors and independents.

Yet the independents usually get their gasoline from the major refineries at discount prices and in addition are given a guaranteed margin in price wars. The result is that suppliers have lost control over the price structure — and in fact may be subsidizing price cutting. This situation is not unique to Oklahoma but is prevalent throughout the region.

New evidence cropped up last week that gasoline prices are far from stable in the midlands. Price wars broke out in Wichita and Oklahoma City areas. Signs multiplied that efforts to restore normal prices in Tulsa also were coming unhinged.

On the wholesale market, one reseller in Omaha openly advertized regular gasoline to jobbers or dealers at 9.25 cents per gallon, one-fourth cent off the going price which was already the lowest in a decade. Another reseller reported privately he only had one supplier who would discount the 9.50-cent price. The others were trying to hold the price line there.

What next? The products markets in the Mid-Continent thus offer little encouragement to refiners to cling to an unfavorable crude price.

With 86% of Denver-Julesburg crude now priced at a top of $2.78, the $3.05 top for Kansas and Oklahoma sweet crudes looks out of line. If the lower D-J prices hold and if product prices don't improve, an eventual cut in Kansas or Oklahoma appears likely.

In this connection the explanations for the D-J price cuts are interesting.

Sinclair complained the Rocky Mountain sweet crude contained too much butanes. Blending of butane and natural gasoline into the crudes before they moved to the pipeline reportedly had reached such proportions that value of the crude was effected. Refiners were paying crude prices for a product worth roughly half that amount and burning it under stills because they had no profitable market outlet.

Pure, apparently stung by criticism from producers, said it was being singled out unjustly as a price cutter. K. A. Covell, Pure vice president, reiterated that his company's changes in the East Texas region were prompted by reductions in East Texas field. He said the East Texas cut also adversely affected the price of Denver-Julesburg crude in the north central refining areas, reportedly Toledo.

From other quarters of the industry came these warnings of what a general crude price cut would mean:

A cut in producer income and royalties, already crimped in the prorated states by allowable restrictions.

A drop in exploration and wildcatting which depends upon production income for financing. Concensus of Kansas geologists meeting in Wichita last week was that a price cut would bring exploration in that state virtually to a standstill.

A similar decline in development drilling. The IPAA warned that the downward slide of crude prices already will result in fourth quarter drilling activity dropping below last year.

Just as important, a price cut will not solve the serious problems of product oversupply and cut-throat marketing which are causing the crude cuts in the first place.

Oil-import hearings slated by House group

Small Business subcommittee will take up program issues in Washington sessions next month. Later hearings may be held in other areas.

A WEEK-LONG series of all-day hearings on the oil-import-control program has been scheduled by Rep. Tom Steed (D.-Okla.), chairman of a House Small Business subcommittee.

The hearings will begin in Washington at 10 a.m. November 20 and continue through that week, with time out only for Thanksgiving Day. They will be resumed the following week if all scheduled witnesses have not had an opportunity to appear.

Steed says the first week of the hearings will be for witnesses from interested federal agencies, from state regulatory and conservation departments, from trade associations representing all segments of the oil and coal industries, and from individuals "presently engaged and experienced in various pertinent activities in the oil and coal industries."

Anyone else who wants to be heard may request time.

Steed says later hearings will be held to get statements from interested congressmen as well as additional federal agencies.

Steed had indicated there would be no "road show," but subcommittee staff members say they have had requests for hearings in that field. So such hearings may be scheduled later.

The subcommittee staff has already used questionnaires to obtain information from several hundred oil and coal companies. Also it has gathered information from government departments, including Interior.

When the subcommittee's assignment was originally announced, Rep. Wright Patman (D.-Tex.) said it was to study possible abuses of import quotas by inland refiners. However, the probe was soon broadened until it is virtually a fuels policy study similar to one being conducted by the Senate Interior Committee.

Steed has said that one of the principal purposes is to determine the minimum level of domestic oil needed for national security and to seek means of assuring a continuing adequate supply to meet that need.

Other members of subcommittee are Abraham J. Multer (D.-N. Y.), James Roosevelt (D.-Calif.), Dale Alford (D.-Ark.), H. Allen Smith (R.-Calif.), Ralph Harvey (R.-Ind.), and Arch A. Moore (R.-W. Va.).

J. Allan Sherier, general counsel of the full committee, will be chief counsel for the hearings. Any inquiries regarding matters connected with the hearings should be addressed to him.

Texas stays at 8 days for the seventh month

TEXAS will plug along on its record low 8-day crude allowable for the seventh consecutive month in November.

The issue was open and shut before the October 18 statewide hearing began in Austin. With crude prices crumbling here and there, there was little chance for an increase in producing days.

The November allowable will go up some, however, on a calendar-day basis due to the shorter month.

At 2,706,095 bbl. daily, the allowable represents a hike of 22,881 bbl. daily over the initial allowable for October and a gain of 55,258 bbl. daily over that in effect October 7.

Purchaser sentiment was heavily in favor of the status quo. Only three of the major buyers favored different patterns. Sun Oil Co. and Atlantic Refining Co. nominated for 9 days from their connections, while Phillips Petroleum Co. went the other way with a 7-day nomination.

Phillips has proposed a 3% reduction in production in all states where it has production.

W. B. King of Phillips said the company has cut runs 14,000 bbl. daily below its average in August.

"We are concerned," he said, "about the industry's excessive and burdensome stocks. Such a condition invites erratic and shortsighted actions by some . . ."

Although Phillips has run less crude, King said product supplies have been bolstered by advantageous purchases.

Refinery runs drop sharply in September

Company—	Avg. in bbl. daily*	% of Capacity
Petrofina	24,081	80.3
Atlantic Ref.	179,709	85.5
Bell	6,167	77.1
Bryson Pipe Line	380	35.0
Cities Service	266,724	91.0
Continental	173,985	90.0
Cosden	35,275	82.0
Crown Central	31,703	79.3
Danaho Refining	3,619	30.1
El Paso Natural	25,204	102.9
Gulf	422,103	74.9
Humble	744,000	77.3
Indiana Oil	585,100	80.8
LaGloria	16,691	69.6
Monarch	1,872	46.8
Ohio	100,437	86.9
Permian	1,742	43.6
Phillips	218,800	79.8
Plymouth	13,456	29.9
Premier	12,504	56.0
Pure	151,679	81.1
Rado Refining	†1,208	81.0
Shamrock	25,426	94.2
Shell	580,014	97.6
Signal	55,969	93.2
Sinclair	443,278	90.6
Skelly	51,335	94.0
Socony Mobil	576,000	80.3
Sohio	152,700	89.6
Standard (Tex.)	50,663	67.6
Sun	190,903	74.9
Suntide	39,944	61.5
Texaco	643,585	87.1
Tidewater	241,000	87.6
Others	2,994	
September total	6,070,250	
August total	6,444,475	

*As reported to Texas Railroad Commission. †Six stream days.

Another agency heard from:

FTC has gasoline-pricing ideas

Gene T. Kinney
East Coast Editor

THE current battle over U. S. gasoline markets has no more interested spectator—or rather participant—than Rufus E. Wilson, the Government's No. 1 policeman in gasoline pricing.

As the chief of the Federal Trade Commission's division of general trade restraints, this energetic government lawyer has some definite ideas on what is legal and proper among a wide variety of marketing practices. And what Wilson thinks is important to all marketers.

Here are his views on three of the most controversial current issues:

Price differentials. "Private brands are entitled to the customary 2-cent differential in the price at the pump." The reason, according to Wilson, is that the public considers the private-brand product to be of lower quality.

Subregular grades. "I am inclined to think they can legally be sold at private-brand prices if they are advertised as being of lower quality than the company's established house brand."

Area pricing. "It results in discriminatory pricing on the periphery of the designated price zone," Wilson believes.

Rufus E. Wilson
. . . favors independent differential.

Eye on differentials. Wilson's office is following closely the price wars all over the country, and especially those involving attempts to change the historic major-independent differential.

"I am interested," Wilson says, "in the attempts by major oil companies to move into a market and try to eliminate or at least curtail private-brand markets by reducing the traditional differential."

Is any market, large or small, entitled to a price differential above or below a competitor?

"My position," Wilson explains, "is that the public is not aware of the fact that private-brand gasoline is often just as good as major gasoline. The majors brought this situation on themselves by their advertising.

"True, private brands don't offer their gasoline as an inferior product. It is advertised as the highest octane available, and it may be. But the public doesn't believe everything it sees in advertising."

Attempts by majors to recoup lost markets, or move into new ones, by reducing the margin locally or regionally is a "short-cut which I feel violates antitrust laws," Wilson says. "Majors will have to have a better excuse than loss of markets to justify a scheme to eliminate competition," he adds in a firm tone.

Wilson contends that history shows a private-brander will dry up if he does not have the 2-cent differential. He suggests a major marketer has other recourses to meet a successful independent competitor—such as reducing prices uniformly on a nationwide scale.

"This would not be unfair competition or discrimination," the FTC lawyer says. "In this approach the major oil companies would not be drawing upon their vast interstate treasuries to compete unfairly with the small marketers. If the smaller marketers were run out of business, that would be unfortunate but not illegal. I would not attribute this to bad motives. Also, the public would benefit from lower gasoline prices."

A 1½-cent differential? Is the 2-cent differential a permanent part of the marketing scene?

"Not necessarily," Wilson says. "Why not try 1½ cents to try to even out the effects of lower price vs. public acceptance, as well as superior service? The key is public acceptance.

"Some private brands now approach public acceptance comparable to that of the majors. When word gets around that, for example, Billups gasoline is just as good as Esso or American or Texaco, then Billups can no longer lay claim to an umbrella. It is public acceptance that is calling the shots.

"The time is coming when a substantial private brander can no longer command the historical differential on the basis of public acceptance. His acceptance will be as good as a major's, or perhaps better, in local or regional markets."

Subregular grades. These combat grades of gasoline—such as Gulf Oil Corp.'s Gulftane and Sun Oil Co.'s 180 and 190, all of lower quality than the companies house brands—have been the subject of controversy since their introduction in the past year.

One or the other has been priced even with private brands, or 1 cent above, in half a dozen markets.

"I am inclined to think that Gulf can do that with impunity," Wilson comments in singling out one of the marketers for illustration. "It is not illegal. If Gulf is advertising a third grade that is not as good as its house brand Good Gulf, then it is not obliged to observe the traditional 2-cent differential."

Area pricing. Wilson considers area pricing gener-

ally to be "unrealistic" and unfair to dealers along the boundaries of a pricing zone.

"I am not in favor of any arbitrary fixed zone or boundary," he says. "I think somebody is bound to get hurt in such a situation. I took a trip through North Carolina recently and found that the price war emanating from Charlotte, according to what dealers told me, had an impact as far as 200 to 300 miles away.

"Wide-area pricing as practiced by Esso had a great deal to do with the spread of the price war. It is not for me to say whether the method used is wrong. All I can do is look at the results. And wide-area pricing here resulted in discriminatory pricing on the periphery of the designated area."

Is area pricing in itself discriminatory?

"Not if it's realistic," says Wilson. "Why not feather out competitive allowances more gradually? Why not give a little more thought to exceptions to wide-area pricing in order to minimize injury to dealers?"

What does he mean by realistic?

"I might consider a 0.2-cent differential over a 5-mile area to be realistic. But you can find differences of 2 cents or more in existing schemes," Wilson says.

Argo directors approve plan to sell company's $150 million assets

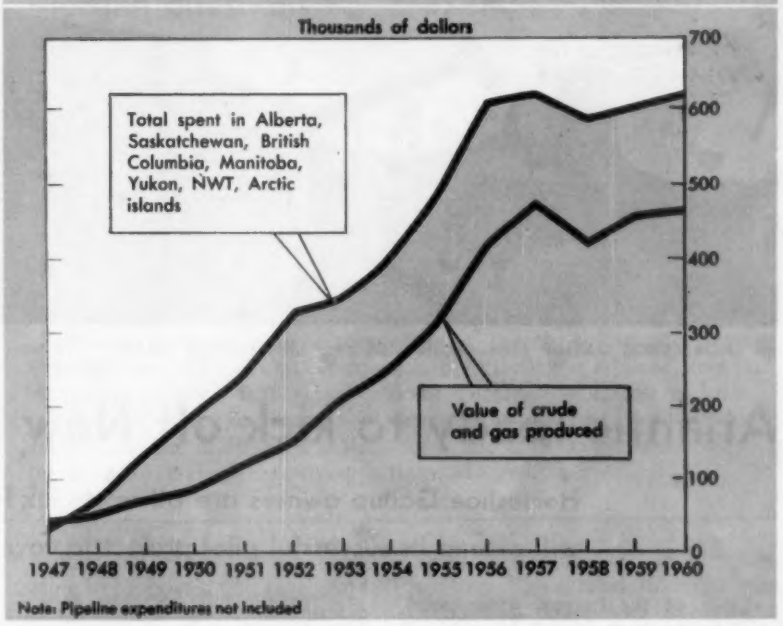
ARGO Oil Corp. will sell all of its $150 million in assets and go out of business under a plan approved by Argo directors last week in Denver.

If stockholders approve in a vote December 5, all oil and gas properties in 17 states will be sold in an ABC-type deal to Atlantic Refining Co. and others.

Involved are leases on 895,000 acres and royalty on 765,000 acres. Argo last year had production of about 13,500 bbl. daily.

About $12 million of the company's assets are in stock held in other companies, and these would not be included in the purchase by Atlantic and others. The deal is subject to favorable tax rulings and certain other conditions.

Canadian oil outlays compared with returns



Oil spending more in Canada

THE petroleum industry spent a total of more than 5 billion dollars on exploration and development in western Canada from 1947 through 1960.

That's the estimate of the Canadian Petroleum Association in the first survey of oil and gas expenditures covering all provinces and areas of western Canada. Actual total was $5,311,800,000.

In announcing completion of the survey, the association said in part:

"The high proportion of returns from the 350 oil companies surveyed has made possible a significant and informative summary.

"The period 1947 to 1960 represents the formative stage in western Canada oil and gas development, and it is significant to note that expenditures increased over this period from $31 million in 1947 to $620 million in 1960."

Government sources show the value of petroleum production, including oil and gas, during the 14-year period totaled about $3,577,021,000.

CPA pointed out that "the year 1957 still remains as the peak (expenditure) year."

A new spending mark is expected this year. Says the CPA: "Large capital expenditures on natural-gas facilities during 1961 will, in all probability, push this year's expenditures to an all-time record."

The survey says Alberta continues to account for more than three-fourths of total western Canada expenditures. The CPA adds:

"With an anticipated increase in British Columbia expenditures, this province should rank second to Alberta in 1961, a position which Saskatchewan has held since 1947."

Expenditures have declined steadily in Saskatchewan since its peak year of 1957. Total of outlays in that year was $112,900,000, but in 1960 the province's expenditures had dropped to $58 million.

Other 1960 expenditures, by province: Alberta, $480,500,000; British Columbia, $56,000,000; Manitoba, $9,600,000; Yukon, Northwest Territories, and Arctic islands, $15,500,000.

The survey pointed up the expansion of exploration in the Yukon, Northwest Territories, and Arctic islands. Exploration expenditures in the three areas totaled about $900,000 in 1951, including land acquisitions. In 1960, exploration outlays — including test drilling — had climbed to $14,500,000.

HORSESHOE GALLUP producer, located near chimney-rock landmark, is one of 200 wells slated for unit operation.

Atlantic ready to kick off New Mexico flood

Horseshoe Gallup owners are all set to ink formal unit agreement. Atlantic will extend its successful pilot project to cover 8,000 acres and 200 wells.

ONE of the biggest water-flood projects in northwestern New Mexico will start up in shallow Horseshoe Gallup field before the end of the year.

A unitized, pressure-maintenance program in the field's upper and lower Tocito zones of the Gallup has been approved in substance by working and royalty interests.

It will take in roughly 8,000 acres and about 200 wells. And it will hike total oil recovery from the unit by an estimated 25,000,000 to 40,000,000 bbl.

Last big stumbling block was hurdled when the U. S. Geological Survey and the Bureau of Indian Affairs approved the unit agreement, subject to minor change.

It's expected that official signing of the agreement by all parties will take place in November.

Atlantic Refining Co., with a 43.5% participating interest in the unit, will be the operator.

The unit flood actually will develop as a broad extension of a two-section project launched by Atlantic on its own acreage last November. Injection into the Tocito, which dips from a top of about 1,100 ft. in the northwest to about 1,600 ft. to the southeast, will be through a combination of five and nine-spot patterns.

In the central portion of the field, where the pay is more porous and permeable, the operator will use nine spots. Five-spot patterns will be used in the tighter edge areas.

INJECTIONS already have started on Atlantic's own Horseshoe acreage. Full-scale water flood will cover 8,000 acres.

Atlantic already has seen evidence in its area of favorable response to flooding. Pressure decline appears to be stabilizing. And production declines are leveling off.

New record for speed? Along with the size of the project, the Horseshoe flood is raising some eyebrows over the speed with which it is getting under way.

Field development really started only about 3½ years ago, when El Paso Natural Gas Products Co. laid a pipeline in the field in May 1958.

The discovery was drilled in June 1956 by Arizona Explorations, Inc., Dallas. But productivity of the well was low, due probably to a faulty frac job. And it caused little excitement. Interest perked up a bit when the same operator brought in a 1½-mile stepout to the north for more than 100 bbl. a day, some months later. But the pipeline entry really kicked it off (OGJ, March 2, 1959, p. 62).

Atlantic, for instance, used assembly-line drilling techniques on its wide acreage holdings—and com-

pleted 75 wells in less than a year. Only two of them were dry.

The company used a "rat-hole" rig to start a hole to 20 to 30 ft., then a cable-tool rig to drill to 100 ft. and set surface pipe, then a rotary to drill to total depth, and finally a completion rig to move in and finish the job.

Pressure low, declining. Field pressure started out low at around 200 psi. And under the impetus of large allowables (70 bbl. per day per well) and the reservoir's solution-gas-drive mechanism, pressure began to fall fast.

It was painfully apparent to Atlantic and other operators that some form of pressure-maintenance was an early necessity. Atlantic launched its own study in the fall of 1959. A miscible flood was out of the question due to the high pressures required to conduct it and the shallow depth of the reservoir.

The study showed water flooding to be the best of available methods. The company called an operators meeting to propose a unit plan. And while the unit ground to fruition, it started flooding its own leases.

Production from the two Tocito zones is commingled. Input wells, however, are dualed to inject into both. This policy will be extended over the field when the expanded flood begins.

Morgan questions FPC's exemption powers

FEDERAL Power Commissioner Howard Morgan doubts that FPC has the legal authority to exempt small natural-gas producers from regulation.

Morgan said last week that while he had been hopeful that this could be done, "recent studies indicate some serious problems."

He said existing law seemingly allows the commission no leeway for treating one producer in a different manner from another merely because of size.

Furthermore, he said, even if such authority were specifically granted by Congress, the exemption of small producers would probably trigger escalation clauses in major contracts.

Morgan's views were expressed in a speech before the West Central Texas Oil and Gas Association in a meeting at Abilene. It was the commissioner's first major address since taking office in June.

Morgan agreed in general with the opinions outlined by Chairman Joseph Swidler in Houston (OGJ, Sept. 25, p. 94), particularly on the need for giving area-pricing a thorough trial.

Texas small-tract drilling dispute flares again

THE LONG fracas over small-tract drilling in Texas' Normanna gas field fired up again last week in Austin.

This time it was over Bright & Schiff's application to the Texas Railroad Commission for an exception to the field's new 100% acreage allocation formula and a special allowable for its beleaguered 1 Joyce, a producing well completed on a 0.3-acre lease.

Bright & Schiff asked the commission for a 100-acre allowable for its well. Attorney Robert B. Payne said the Dallas independent is entitled to such an allowable under the commission's recent Normanna order (OGJ, Oct. 9, p. 61) because:

1. The acreage allowable for the 1 Joyce is "zero for all practical purposes," and its operation isn't economically feasible.

2. Adjacent operators have declined to take the Joyce tract into a pooling unit.

Attorneys for Atlantic Refining Co., Tidewater Oil Co., Tenneco Corp., and others argued that Bright & Schiff had made no reasonable offer to pool. And they strenuously opposed a 100-acre allowable for the 1 Joyce. Such an allowable would permit Bright & Schiff to produce about the same amount of gas, they said, as would the two-thirds acreage, one-third well formula invalidated by the Texas Supreme Court as being unjust.

They asked that any special allowable granted be limited to no more than a 60-acre base and that it not exceed 200,000 cu. ft. per calendar day.

H. R. Bright, partner in Bright & Schiff, said his calculations show that a 100-acre allowable would let the 1 Joyce produce 7,162 000 cu. ft. of gas per month. This, he said, would produce income to the company of $241,435 over a 22-year productive well life—and this income has a present net worth of only $124,363. Bright argued that this amount would be far less than the cost of the well.

J. W. Stayton, attorney for Atlantic, said his figures show that Bright & Schiff is asking for an allowable which would give it 4,000 times the amount of gas and liquids under its tract.

Furthermore, he said, it would give it a 250-to-1 daily production advantage over a 320-acre unit.

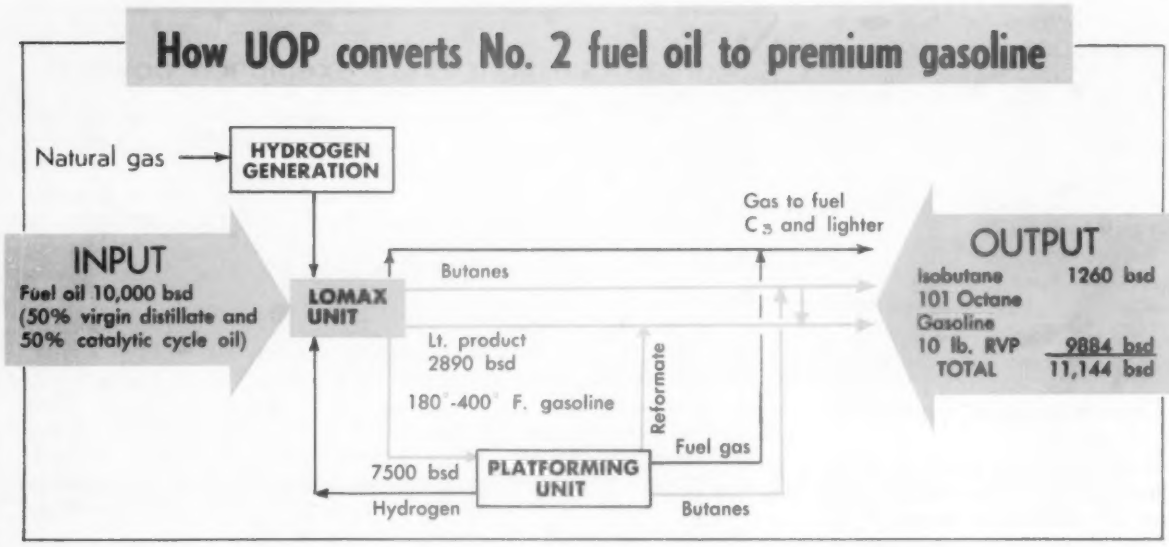
This, he said, would be flaunting the Texas Supreme Court's orders.

Sohio ends exploration in the Rockies

SOHIO Petroleum Co. is shutting down its exploration activity in the Rocky Mountains, has curtailed its Mid-Continent exploration, and will concentrate its future wildcatting in the Gulf Coast and Canadian areas.

The company has turned over all its undeveloped acreage in Wyoming, Montana, and Utah to Arthur M. Culver Co., Denver oil broker for disposition. The deal involves 176,750 acres. Only Sohio acreage not included is four blocks in Montana and Wyoming which are now involved in farmout negotiations. Sohio sold off its undeveloped acreage in Colorado several years ago.

With the Casper exploration office closed, only Sohio personnel remaining in the Rockies are production people. The company reportedly plans to retain all its producing properties plus strategic acreage surrounding them. Only the wildcat acreage is up for sale at this time.



Hydrocracking offers refiners flexibility

A wide range of feed stocks can be charged to hydrocracking units, according to developers of three different licensed processes. Process also gives payout of 4 years or less.

REFINERS got a closer look at hydrocracking during the annual meeting of the California Natural Gasoline Association in Long Beach.

First report of the operations of a Lomax unit which went on stream in August at Powerine Oil Co.'s Santa Fe Springs, Calif., refinery was part of the three-paper hydrocracking program at CNGA. Lomax is a Universal Oil Products Co., Inc., process. Isocracking, developed by California Research Corp., and Unicracking, a Union Oil Co. development, also were discussed.

The Lomax unit at Santa Fe Springs is producing a yield of 117.9% from a diesel-oil feed stock. A charge of 1,597 bbl. results in a yield of 1,883 bbl., including 1,085 bbl. (67.9%) of C_7+ gasoline, 541 bbl. (33.9%) of C_5-C_6 blending stocks, and 257 bbl. (16.1%) butane and isobutane.

In addition to the increase in yield over charge, the unit has raised the 15,400-bbl. refinery's gasoline production approximately 20% and kicked up the gasoline pool 5 octane numbers after Platforming the Lomax product. The unit also produces gasoline with a higher sensitivity, which leads to better road performance, and with a lower bromine count, which helps meet smog regulations set up by Los Angeles.

The hydrogen requirements for the Powerine units are estimated at 2.5% by weight of the feed.

The yields reported for Isocracking and Unicracking were similar to those of a Lomax unit. Isocracking produces a yield of about 120% depending on the feed and Unicracking a yield of 116% when charging a coker gas-oil and 123.3% when charging a catalytic cracked cycle oil.

Costs. Hydrocracking will pay out in from 1 to 4 years, according to the CNGA reports.

W. H. Claussen, who presented the Calresearch paper, says a 7,000-bbl. Isocracker charging catalytic cracker cycle oil will pay out in 2 years. Total investment would be $3.8 million. A 15,000-bbl. Isocracker charging cycle oil would cost $6.9 million and pay out in 1.6 years.

Union's J. H. Duir and P. F. Helfrey say a Unicracker will pay out in from 1 to 4 years. A 10,000-bbl. unit operating on light distillate would cost $4.8 million and would operate at the cost of 43.8 cents per daily barrel. The same sized unit charging catalytic cracked cycle oil would cost $6.6 million and would have operating costs of 56.9 cents per daily barrel.

The payout on a 10,000-bbl. Lomax unit operating on No. 2 fuel oil would be 2.7 years, according to UOP's James G. Eckhouse. The 2.7-year payout is based on a 5-cent spread between the cost of the fuel oil and the 101-octane gasoline produced. If this spread is increased to 6.5 cents, the payout is cut to 2 years.

Flexibility. All three papers stressed the wide range of feedstocks which can be charged in a hydrocracking unit and the corresponding yields.

The flexibility of the process has been shown in the slightly more than 2 years a 1,000-bbl. Isocracker has been on stream at Standard Oil Co. of California's Richmond, Calif., refinery. This flexibility also is evident from the 50,000 bbl of Isocracking capacity either on stream or planned. Four units going into domestic refineries are designed for a high gasoline yield; a unit going into a German refinery is aimed at both a middle distillate and gasoline yield.

Claussen says the process also points to a higher gasoline output from less crude. Isocracking is

capable of getting a 90% gasoline yield from 30°-gravity crude, he says.

Calresearch recommends little product conversion during the first stage of Isocracking when a refiner is aiming at maximum gasoline yield. The first stage primarily is hydrofining, with product conversion coming during the second stage at the rate of 60% per pass. This pattern leads to higher octanes and a maximum gasoline output.

UOP also has come up with some high gasoline yields in a recent study of processing 22°-gravity crude to the ultimate yield. A gasoline yield of 94% is possible by coking the atmospheric reduced crude, converting both the virgin gas oil and coker gas oil to ultimate gasoline yield in a Lomax unit, reforming and Platforming all virgin and cracked naphthas.

Sun Oil turns over interest in Houdry to Air Products

SUN Oil Co. is passing its 47% interest in Houdry Process Corp. to Air Products & Chemicals, Inc.

Air Products paid Sun cash for 80,000 shares of Houdry common and is trading one share of Air Products for each of Sun's remaining 80,000 Houdry shares.

If the remaining Houdry stockholders accept Air Products' offer of a one-for-one stock trade, Houdry will become an autonomous division of the company. Catalytic Construction Co., a wholly owned subsidiary of Houdry, would become an Air Products subsidiary.

In announcing Sun's acceptance of Air Products' offer, Clarence Thayer, senior vice president, said that in recent years both Sun and Houdry have increasingly expanded in the chemical field. Disposal of Sun's interest would give both companies greater freedom for expansion in process development and manufacturing, he said.

Houdry originally was solely in the field of designing and licensing catalytic cracking and dehydrogenation processes. In the early 1950's, catalyst manufacturing became a major part of its business. Since 1955 it has diversified further into chemicals manufacturing.

WATCHING WASHINGTON

with Clyde La Motte

FPC sends a new hearing examiner into area-price lineup

THERE WAS a new face in the lineup at the recent Permian basin area-price hearing in Washington. The newcomer was Seymour Wenner, the Federal Power Commission hearing examiner who presided at the meeting.

Wenner, a graduate of Harvard, only recently joined the FPC. Before doing so, he had been a hearing examiner for 2 years at the Interstate Commerce Commission. Prior to that, he was an attorney for the Civil Aeronautics Board for more than 20 years.

He is new to natural-gas regulation. And that seems to have been one reason he was chosen to ride herd on the area-price hearing; he would have few preconceived opinions or biases.

It is understood that Chief Examiner Edward B. Marsh, who presided at the pre-hearing conferences held earlier, ruled himself out of this one because he had already developed some pretty firm opinions. You will recall, for instance, that his original report on the conferences suggested that the FPC should consider abandoning the area-price approach.

So Wenner, with no scars from previous battles at FPC, was sent into the fray.

One thing that Wenner appears bent on at this stage is to keep the hearing moving at as rapid a clip as possible. This was apparent at the first hearing, particularly when he brushed aside protests of consumer groups that they were not being given enough time to prepare their side of the case.

Shorter depreciation periods for plants, equipment likely

THE Administration is now leaning toward a combination of faster tax writeoffs and a modified plan of special tax credits to encourage construction of new plant facilities and equipment.

The President earlier this year recommended to Congress a sliding-scale tax credit incentive plan, but it was received coolly for the most part by both Congress and industry.

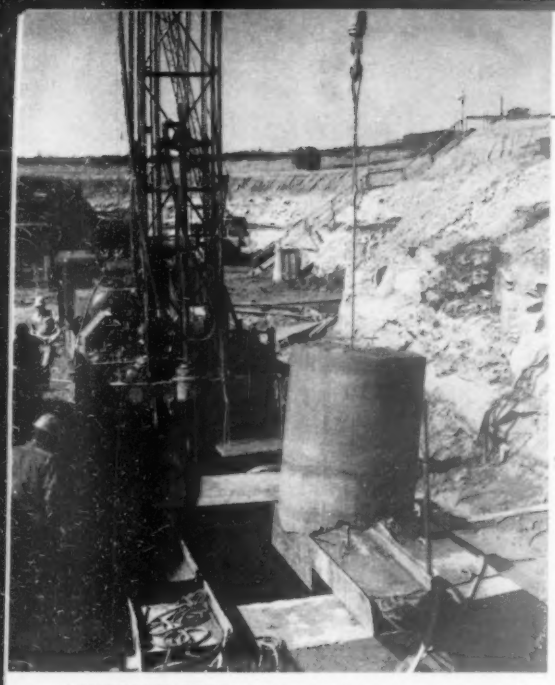
Henry H. Fowler, undersecretary of Treasury, said in a recent speech that industry opposition apparently stemmed from a fear that the adoption of the investment-credit approach would block any progress on redetermination of the proper length of life of plants and equipment.

Fowler said this fear wasn't justified, and that a study of depreciation schedules was under way for all industries. He indicated that changes in Internal Revenue Service's Bulletin F can be expected in many areas, and pointed as proof to a recent White House statement in connection with the sharp modification—already being made—affecting depreciation allowances for the textile industry.

Kennedy covered the map in making FPC appointments

GEOGRAPHICALLY, the new makeup of the FPC provides a good cross-section of the U. S.

Chairman Joseph C. Swidler is from the South (Tennessee), Lawrence J. O'Connor, Jr., is from the Southwest (Texas), Howard Morgan is from the Pacific Northwest (Oregon), and Charles R. Ross is from the extreme Northeast (Vermont). If, as some are predicting, a man is picked from the Midwest (probably Illinois) to succeed Jerome Kuykendall January 1, almost every major section will be represented.



LIMESTONE CORE, 40 in. in diameter, was cut with steel barrel at Kansas missile site.

Small rig cuts mammoth cores

A TRUCK MOUNTED rotary rig is drilling 42-in.-diameter continuous-core holes at missile bases in Kansas.

The job involves sinking three 42-in. by 40-ft. vent shafts around each of 18 Titan II underground missile silos. The rig is a Failing Blastmaster, manufactured by George E. Failing Co., Enid, Okla.

Location and diameter of the holes ruled out cone-type bits and a conventional oil-field rig, says Robert R. Aitken, Wichita, Kans., consulting geologist on the project. Special 4-ft.-long steel core barrels do the cutting.

When making hole, the rig sits on steel girders over a 30-ft.-deep cellar. Drilling starts on the cellar floor, making the completed hole 70 ft. from the surface. When the barrel is full, crewmen pull it and drill a small hole through the center of the 40-in. core. A device forced through the hole grips the core for lifting. The cores sometimes part along formation lines but often have to be blasted loose.

Using air circulation, the barrels bite through Sumner shales at the rate of 5 ft. per hour. They cut limestones at the rate of 1½ to 3⅓ ft. an hour at rotating speeds from 12 to 60 r.p.m.

Pay boost coming for Permian basin rig crews

West Texas-New Mexico contractors join in round of pay increases. Some will go to 48-hour week, others to give 10% raise and keep 56-hour week.

CONTRACTORS operating 80% of rigs working the West Texas-New Mexico area, or roughly 260 of the 325 available rigs in the area, will raise wages by November 15.

The increase, at least initially, won't be uniform. So far 32 contractors are planning wage hikes. About half the rigs owned by these firms will go to a 48-hour work week with the same weekly take-home pay. This has the effect of raising hourly wages for drillers about 66 cents, to $3.52 an hour from the present $2.86 rate. Hourly rates for derrickmen and motormen would go up to $2.66 and for floormen to $2.54.

The remaining contractors will retain the 56-hour week, while hiking hourly wages about 28 cents an hour to a new rate for drillers of $3.14 an hour. This is the same route taken earlier this fall by several contractors for their Gulf Coast crews.

The breakdown looks like this: 13 companies operating 125 rigs will go on 48-hour plan, while 19 contractors operating 126 rigs will stay on 56 hours with 10% pay hike.

Weight leans to 48. Such an even balance would appear to leave the West Texas-New Mexico wage picture in pretty much of a deadlock.

But informed sources point out that the majority of the big contractors are in the 48-hour bracket. And the feeling is that they eventually will swing the industry that way.

Among those going to the 48-hour week are: Delta Drilling, Sharp Drilling, B.B.M., Great Western, Rowan, Llano, A. W. Thompson, Carl B. King, Helmerich & Payne, and Johnn Drilling.

Most of those in the 56-hour group, with one big exception, operate fewer and mostly smaller rigs.

The big exception is Parker Drilling Co., which operates upwards of 20 rigs in the area.

The prime argument against a short work week advanced by these contractors is that their smaller rigs with their shorter working time on a project are down a lot of the time. And time off from the job is not a problem with their crews.

Those in the other group insist that a simple wage increase may perhaps hold older employes but simply will not attract the new blood so badly needed in the drilling industry. Key drilling employes, they say, are getting old and retiring. And most contractors have had very little success trying to recruit new ones. The industry, they say, is headed for very serious trouble if hours are not cut. Oil companies are aware of the problem and sympathetic to it, they contend. And now is the time to move.

Some move more broadly. With some of the big contractors, the move to a shorter week is not restricted to the Permian basin area.

At least three big contractors plan now to cut hours wherever they operate by November 15.

They include: Sharp Drilling, Delta Drilling, and Rowan. Helmerich & Payne reportedly plans to adopt a 48-hour week also wherever it can.

The long-range view. What will be the long-range outcome nationwide? Some informed sources predict that, possibly within a year, this will happen:

Contractors now going to 48 hours will adopt a 10% pay increase.

And those now giving a 10%

pay hike and staying on 56 hours will go to 48.

Such a development would bring the wage situation back into balance on one general scale.

Mid-America will raise capacity of LPG line's western leg 8,500 bbl.

THE second expansion project within the first year of operation is planned by Mid-America Pipeline Co., this time on the west leg of its LPG system.

President Robert E. Thomas announced that pumping capacity of the west leg will be boosted with installation of two new stations near Abilene, Kans., and Beatrice, Neb.

Cost of the work will be $200,000 and will increase capacity of the system north of Conway, Kans., to 43,500 bbl. daily. The new work is in addition to one pumping station authorized earlier in 1961 on the same leg to step up capacity from 32,000 to 35,000 bbl. daily. The two additional units will increase system capacity north of the Conway terminal to 75,500 bbl. daily on the two legs of the line.

The 2,200-mile LPG pipeline system extending from New Mexico-Texas border to Minnesota and Wisconsin was only completed last December.

Checking oil's economic pulse

Still high: Runs and stocks

REFINERY runs just keep bumping the top. They averaged 8,324,000 bbl. daily for the week ended October 13, up 169,000 bbl. daily over the week before.

A big portion of the weekly increase was in the Texas Gulf Coast district where runs were up 117,000 bbl. daily. Other large gains occurred on Louisiana Gulf Coast and the West Coast.

The products stocks picture: Gasoline up 631,000 bbl. for the week, the fifth weekly increase this fall; kerosine up 64,000 bbl.; distillate up 3,981,000 bbl.; and residual down 98,000 bbl.

Both gasoline and distillate stock levels are lower than they were a year ago but are well above desirable levels for mid-October.

Lower: Drilling activity begins to slip

ACTIVE rotary rigs dropped below the 1,800 mark last week for the first time since late June. Total tools reported at work was 1,797.

The July-October period this year so far has been better than last year. Rig totals were below 1,800 every week of the corresponding period last year. The 15-week average in 1961 was 1,727 rigs while it is 1,845 rigs this year, a gain of 6.8%.

Slight improvement: Completions increase

OIL operators have completed 35,984 wells this year through October 14, only slightly more than the 35,855 wells completed during the same time last year.

With only 11 more weeks remaining in the calendar year, operators must average 1,001 wells per week to reach the 47,000-well mark. For a goal of 48,000 wells the average must be 1,092 completions per week.

Alaskans warned to go easy on taxes

THE ATTITUDE of the company which operates Alaska's only commercial oil field is one of "qualified optimism" toward the state's oil future.

"We have seen enough favorable development so far to be optimistic. We are also aware that the financial risks involved, the geographical and other obstacles to overcome, are far from insignificant."

This appraisal was made by Howard G. Vesper, president of Standard Oil Co. of California, Western Operations, Inc., while speaking before the Alaskan State Chamber of Commerce in Ketchikan.

Noting that federal grants to Alaska will end in 1963, Vesper urged his Alaskan audience to adopt tax policies which will encourage oil development.

The Standard of Cal executive warned that if oil is strapped with heavy state taxes "you may be reasonably certain that oil money which would otherwise flow into Alaska will seek other, more hospitable climes."

Growth. Vesper said oil production in Swanson River field has reached 23,750 bbl. daily from 42 wells and that the crude is finding a ready market in California and the Puget Sound refineries.

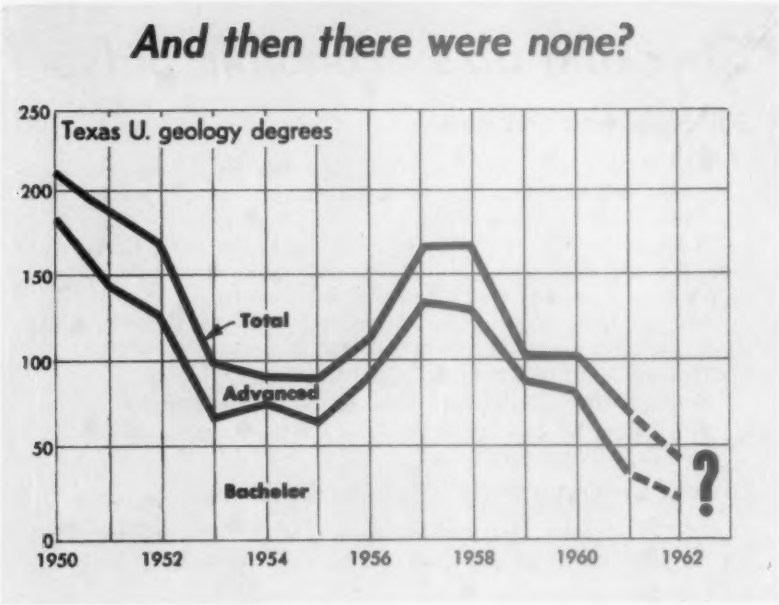
Although four wildcats recently have been plugged, five others are drilling, two more are programed, and four others likely will be drilled within the next year on the Kenai Peninsula, Bristol Bay, and St. Elias basins. Five geophysical crews also are working in Alaska. During the summer 16 field parties did surface geological work.

Standard of Cal is moving ahead with its plans for a 20,000-bbl. refinery on the Kenai. Target date for completion is mid-1963, but it may be finished late in 1962. The $10 million plant will be a crude distillation operation with the light ends scheduled to be shipped to California for further processing.

Vesper added:

"I can't guarantee you that these efforts are certain to meet with unqualified success. No one can. But I can assure you that with the encouragement of government with the support of Alaska's people, with the cooperation of nature and some plain, old-fashioned good luck—we're going to be busy here in Alaska for a good many years."

"We're going to be busy hunting for your oil and—I hope—finding it."



Geologists shortage predicted

Texas University says low enrollments in recent years will be felt as demand for geologists starts upswing.

GEOLOGISTS, the wallflowers of today's oil industry, may take on new glamor.

There will soon be a conspicious shortage of them, the University of Texas is predicting.

Back in 1950 Texas gave degrees to 213 geologists. Today there aren't that many students in the graduate and undergraduate schools combined.

This spring, the number of degrees had dropped to 70, and next year Texas University officials estimate they'll award only 43.

Say Chairman Samuel P. Ellison, Jr., and Prof. Stephen E. Clabaugh, the outlook is even worse. The number of graduates usually is only a small portion of the freshman or sophomore classes. And here the picture is beginning to get bleak. Texas now has only 17 sophomore geology majors and 16 freshmen.

Why a shortage? Ellison and Clabaugh point to two trends which will mean a shortage of geologists for several years to come.

During the past 4 years, they say, very few "bright college students" have enrolled as geology majors. During the same period, oil companies have been leaning more toward hiring only geologists with advanced degrees.

Together, these trends mean that for at least the next 5 years there will not be nearly enough advanced degrees awarded to meet demand.

Ellison and Clabaugh say there are two principal factors behind the shortage:

Oversupply of oil, which led to a restriction of domestic production and put the pressure on companies for economy.

Oversupply of geologists caused, they say, by a postwar shortage of talent which attracted many new students. The number was swollen by federal aid to veterans, and the result was a glut of geologists which became most apparent with the oversupply situation that followed the Suez crisis.

What's cooking. Texas is strengthening its courses to give geology more stature.

It is devising a program for a BS in engineering with geology as the major. This would give the student 36 hours of geology, but at the same time equip him to qualify as a registered engineer.

Ellison and Clabaugh think there's little to be done for the near future. The graduates of the next few years are already underclassmen. But they're fully expecting a pickup next year in beginning students in geology.

Shell takes hand in Oklahoma-St. Louis gas-pipeline project

SHELL Oil Co. is joining Fish Engineering Corp. and Pan American Petroleum Corp. in building a 600-mile gas pipeline from western Oklahoma to the St. Louis industrial area.

Shell has acquired an interest in Oklahoma Illinois Gas Pipeline Co., headquartered in Tulsa, marking its entrance into the gas-transmission business. J. E. Clark, Shell's executive vice president in charge of exploration and production, says the move is in line with the company's long-range program of diversification.

Shell, like Pan American, holds large blocks of leases in western Oklahoma's growing gas-producing area. The new pipeline will afford still another market for their reserves and provide a fifth major purchaser in the region.

R. D. Ricketts, president of Fish and of Oklahoma Illinois, says a certificate application will be filed with the Federal Power Commission before year's end.

The Oklahoma Illinois project is one of several which in recent years have been proposed to serve the St. Louis industrial area of Missouri and Illinois.

This growing market has been served for 30 years by a single supplier—Mississippi River Fuel Corp. The pipeline and its customers, including Laclede Gas Co., St. Louis distributor, have for years been feuding over supply, allocation, and rates.

Earlier efforts to put together a new project lacked the know-how and resources of the Oklahoma Illinois group. In Shell and Pan American, the group has two of the largest gas producers. Fish has made an outstanding record for successful pipeline promotions, including such achievements as Transcontinental Gas Pipe Line Corp., and Pacific Northwest Pipeline Corp. (now absorbed by El Paso Natural Gas Co.).

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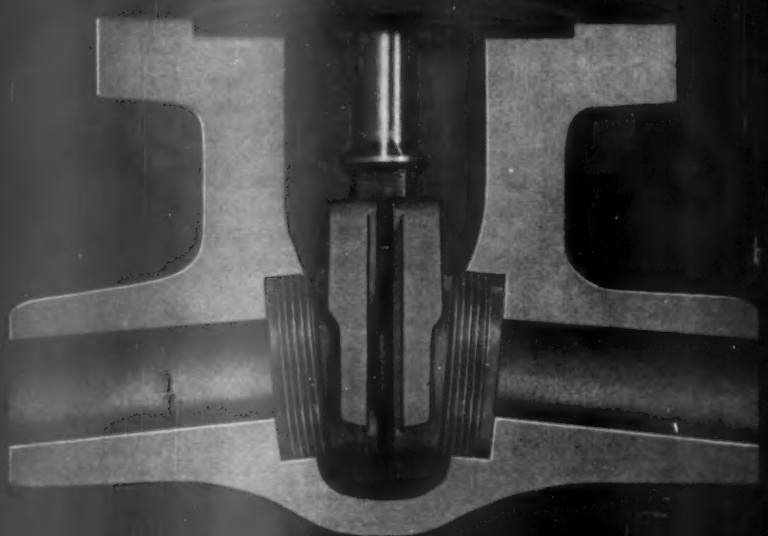

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Pure's program to up-grade stations shows

Last stage carries training right down to the attendant who wipes the windshield.

W. A. Bachman
Marketing editor

PURE Oil Co. is nearing the final stages of a 5-year program aimed at giving the company the best corps of service-station dealers in the industry.

Simply put, the program is designed to make good businessmen out of both Pure's salesmen and the dealers under their supervision. The entire approach: How to manage a business for volume and profit.

This may sound academic and theoretical. But H. C. Havens, Pure sales training manager who has charge of the project, planned carefully on a practical basis and moved in slow stages to achieve a sound and broad training.

Pure executives say they already can count benefits from the campaign in the improved caliber of their new dealers, in higher morale, and in more profitable operations from their older dealers. They are convinced it will pay big future dividends.

Why the fuss. The training program was born in 1956, principally to combat high dealer-turnover.

Pure found it wasn't attracting the caliber of men required to make a success of a service-station operation. As a result, many of its dealers weren't doing well and were leaving. The situation stymied company plans to expand its outlets.

Pure had no formal training worthy of being called a program. So marketing bosses started casting around for a plan that would do two things: Upgrade the dealer force, and make the Pure station image a bit shinier as an opportunity for a good business man.

The expensive loss of dealers is not a problem unique with Pure. Every oil marketer faces the same headache. Some companies pay lip service to the training of dealers, and several have formal programs.

The ingredients. Research quickly showed Pure officials which way to direct their campaign.

A survey was made among 50 Pure and 50 competitive dealers. Data showed an average net profit of 7% before dealer salary or drawing account, or 3 cents per gallon of gasoline. An analysis covering dealers who had full facility-type stations with proper management, however, showed an 11% net profit before salary or 5.2 cents per gallon.

Havens reports that further analysis of the more successful group revealed a number of common traits and policies. He terms these the ingredients of dealer success. They are the basis of Pure's "Management for Volume and Profits" program.

The two sides of a dealer's success pattern were found to be:

Station personality, the impression that people get of a dealer and his station, which builds volume. Contributing to the human impression are the dealer's attitude, his knowledge and skills, his salesmanship and service, and the type of employes on his force. The impression he makes as a businessman is based on eye appeal and convenience of his station, the advertising and merchandising used, and his stock and equipment.

Station health, measured by the earnings a dealer is able to get from operating his business. His earnings performance is determined by his net sales, operating expenses, profit, and living needs. His financial strength depends on assets, liabilities, net worth, and working capital.

Pure set up these evaluation standards for financial strength: 15% of net profit reinvested in the business. a ratio of $2 in cash for each $1 in personal credit, a 2-to-1 ratio of current assets to current liabilities, and a 1-to-1 ratio of quick assets to current liabilities.

The program. After 2 years of research and field testing, Havens and his co-workers outlined this three-step program to retrain Pure's sales force:

Counseling. Remodel Pure's salesmen and territorial representatives into management counselors.

Recruiting. Acquaint Pure employes, civic leaders, and interested prospects with the opportunity of operating an individual business.

Training. Give new dealers the knowledge and skills needed to manage a station profitably.

In 1958, Pure began holding a series of clinics to help the dealer salesmen, distributors, and supervisors solve the problems of retail marketing.

The salesmen learned the fundamentals of station personality and health and how to bind them together for building volume and profits. They learned how to spot problems, analyze them, and reach

early results

a solution. They also were given helpful guides for evaluating station performance, securing more customers, and analyzing results in order to gain more profits.

After a preliminary 2-day session, the clinics recessed. Each salesman selected the station in his territory that posed the greatest challenge and started counseling this dealer on better operations.

After a week, each salesman returned to the clinic for a final 2-day session during which his progress as a counselor was reported and evaluated. Salesmen continued counseling their "beachhead" dealer as long as necessary and also added other dealers to their list.

The clinics and management-counseling technique form a continuing, long-range program of personnel development.

Find 'em first. The second phase of Pure's dealer program is called "Operation Double Q"—recruitment for quantity and quality.

Its aim is to interest and recruit the men who have qualifications necessary for success in the service-station business.

Pure's first objective was to round up dealer prospects genuinely interested in having their own business and to select quality dealers from this group.

Test conferences were held early this year in Dayton, Ohio, and Tampa, Fla., and conferences in each district started in midyear.

The program was divided into two 3-day conferences separated by a 2-week interval. The first half of the program was devoted to recruiting and the second half to selection. Students again were Pure salesmen and supervisors.

The recruitment conference dwelt heavily on the many methods for recruiting prospects, including personal contacts, referrals from others, group contacts, and advertising. Special manuals on dealer recruitment were distributed. They gave detailed advice on the principles and skills of recruitment and contained a sample of all the tools and forms needed. Pure also has devised other recruiting aids. These include:

A new brochure, "The Opportunities of Independence," illustrating the opportunities and requirements of ownership in the service-station business—and with Pure Oil specifically.

Business-opportunity clinic in which interested people in an area are invited to learn about the service-station business. These clinics are conducted by Pure district personnel.

New motion picture, called "Man of the Year," has been released by Pure for use on television. This combines entertainment and information about the service-station business. It's the story of a Pure dealer who is elected "man of the year" by his local businessman's organization.

Recruiting exhibits have been designed for use at fairs, local trade shows, and the like.

Practical work. After all the techniques and tools are explained, salesmen are given a chance to practice "recruit selling" at a conference. They get solid experience during the 2 or 3-week intermission when they return to their areas and conduct a recruiting campaign.

The second 3-day training session is devoted to selecting the likely dealer candidates from lists of prospects. The salesmen are trained during this session on how to sell the Pure Oil franchise and how to sell a specific service-station proposal. This practice in selling takes about one-half of the time. The other portion of the session is devoted to ways of picking qualified service-station dealers.

It's too early to evaluate results of the recruiting conferences, but results so far are cheering. After a Miami session, dealer salesman secured 102 dealer prospects from 507 contacts. Even before the selection conference, eight of these prospects were selected to become Pure dealers.

Dealer training. Pure is just now entering the final stage of its program—actual dealer-training sessions.

One man in each Pure district coordinates all the various clinics, conferences, and training schools. The gatherings are held at district levels.

The dealer schools will have as students the prospects obtained by salesmen, employes of present dealers, or employes of Pure jobbers and distributors. The students will vary class work with actual training in a station.

When the training sessions actually start graduating dealers, Pure hopes to have an elite sales force with salesmen qualified as management counselors and dealers trained to be good business men. In addition, the company will have its continuing program to tell the story of the service-station business and to recruit better talent.

You can't cut prices to win new customers

THE "GOOD FAITH" defense against price-discrimination charges does not apply to price cuts made to get a new customer, the Federal Trade Commission has ruled.

In effect, the commission majority said, preferential price cuts can be made only as defensive action and not as an aggressive move to woo new customers.

To illustrate: If as a gasoline supplier you give a lower price to one of your customers to meet a similar price offered by a competitor, you can rely on the Supreme Court's ruling that this was justified by competitive conditions.

But, if you know that a rival supplier is giving one of his customers a special price, you cannot meet that preferential price in order to get that customer.

This FTC interpretation was revealed last week in a decision in a case involving Sunshine Biscuits, Inc.

A hearing examiner earlier had ruled that Sunshine had the right to meet in "good faith" equally low prices of competitors whether the customer involved was an old one or a new one. The commission majority overruled the examiner.

Offshore core drilling hits fast pace

Aluminum pipe, new anchoring setup help in drilling 1.7 wells daily.

THE M/V TORRY, a self-propelled core-drilling ship working out of Long Beach, recently racked up an impressive record while drilling in the deep water off Santa Barbara and Ventura counties, California.

The ship completed 48 core holes at the rate of 1.7 a day during a 29-day tour of duty. The holes went to an average of 524 ft. into the ocean floor for a total of 25,160 ft. of hole.

No records on core drilling are available, but the Torry's work is something to shoot at. The ship was working in water from 92 to 886 ft. deep, with moves from one location to another ranging from 1 to 20 miles.

Officials of Western Offshore Drilling & Exploration Co., owners of the vessel, say the fast coring is due to two changes in the Torry's operating procedure:

1. Aluminum drill pipe was used for the entire operation. The contractor says the ease of handling the pipe helped speed up the coring. A 4½-in. string supplied by Aluminum Co. of America was used.

Western Offshore has found the aluminum pipe is more flexible than steel in the unsupported portion of the string from the rotary table down to the ocean floor. The aluminum pipe also has a lower corrosion rate and its lighter weight lessens the load on the draw works.

2. A new anchoring system has cut the time on and off location by 8 to 10 hours. The anchoring innovation is a simple one: Rather than using four anchors, two fore and two aft, only two forward anchors are used.

The new anchoring system also has made it possible for the Torry to drill at greater depths. The ship can now operate in water up to 1,000 ft. deep. The old limit was about 350 ft. of water. The water-depth limit is determined by the drum capacity for anchor cable. By eliminating two anchors, the Torry's anchor-cable capacity was raised without increasing the drum capacity. The contractor uses a ⅞-in. wire line for anchor cable.

SELF-PROPELLED core drilling ship, M/V Torry, on location off California.

Until these innovations were adopted, Western Offshore considered that a well a day meant good core-drilling time. However, during part of the recent assignment, the ship made up 2.3 holes a day while compiling the 1.7-well average.

The ship. The Torry is a 176-ft. motor ship which was converted to a core-drilling vessel in 1957.

The ship is the only self-propelled, center-well drilling vessel afloat. It can make 12 knots under its own power in moving from one location to another.

The Torry is one of two drilling vessels operated by Western Offshore. The other, the Venmac III, is a center-well drilling barge equipped to handle 12,000-ft. wells.

Aurora confident of pipeline's success

AURORA Pipe Line Co. says new discoveries in southwestern Alberta, plus demand forecasts, practically guarantee the success of its proposed condensate line aimed at the Billings, Mont., refining center.

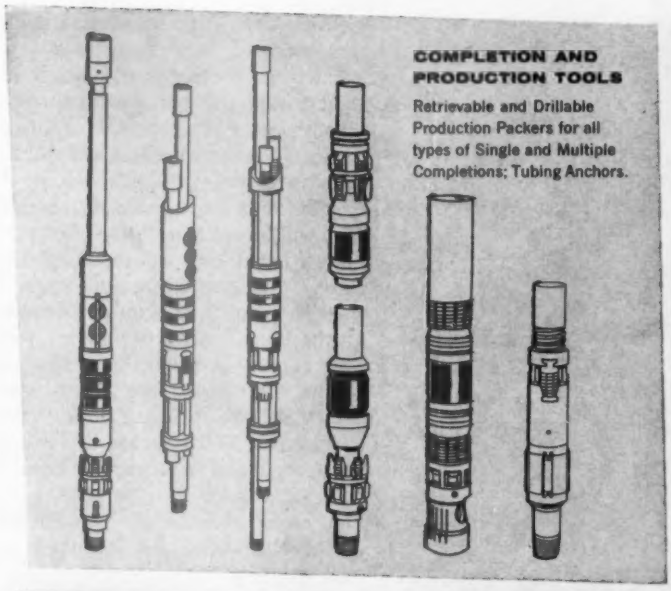
The company has told Canada's National Energy Board that pipeline connections to refining centers in the U. S. Mid-Continent and Rocky Mountain areas are available.

The statements are contained in Aurora's application for authority to build an 8⅝-in. pipeline about ½ mile long. This would run from a point near Carway, Alberta to the Canadian-U. S. boundary line.

At the boundary line, the new link would connect with the trunkline system of Continental Pipe Line Co. Capacity has been placed at 31,000 bbl. daily.

Aurora's short but important line would move crude condensate gathered by the previously authorized Hudson's Bay Oil & Gas Co. system in the Pincher Creek-Waterton field area. Aurora is a subsidiary of Hudson's Bay.

The company's application for the new line will be heard by the board October 26 in Calgary.



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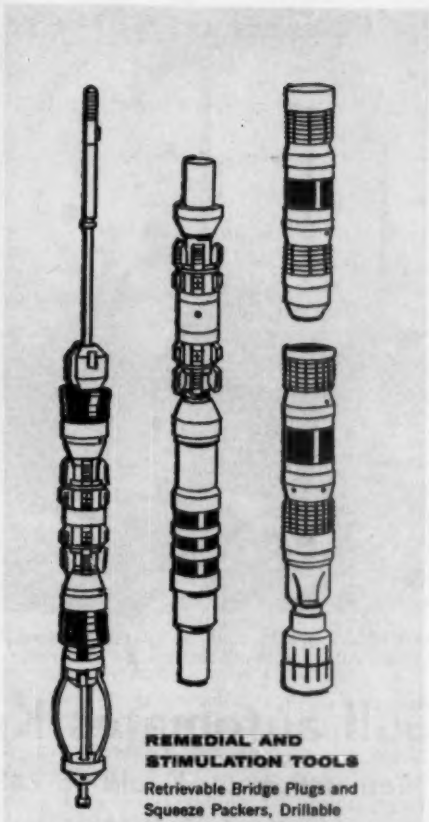

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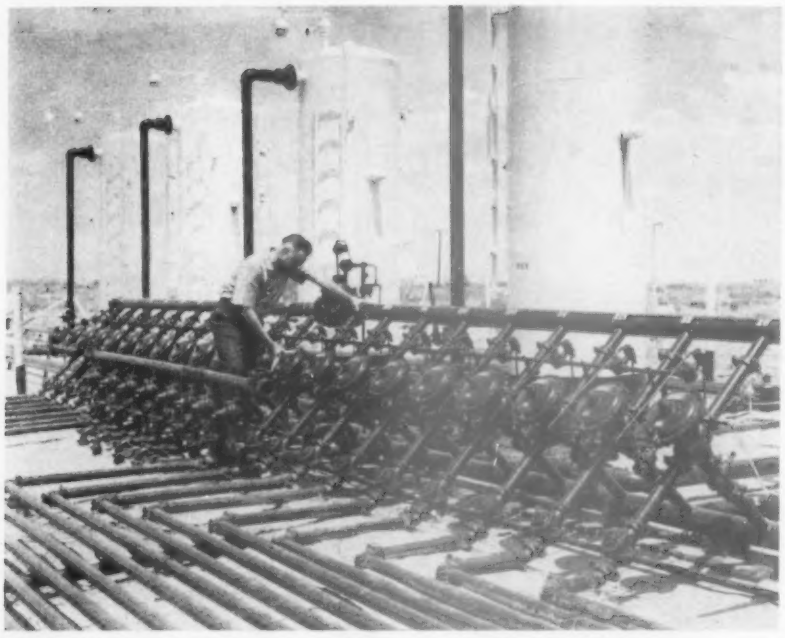

MANIFOLDS are located at 14 test stations in Keystone field. Three-way, two-position valves at manifolds can be operated remotely to place any well on test.

Gulf automates Keystone field

Test stations feed data on 148 wells into central office several miles from field. System will be expanded.

GULF Oil Corp. is pushing the revolution in production automation to a new high level.

Gulf has installed an electronic system in West Texas' Keystone field that will monitor and test 148 producing wells—nearly three times the number ever operated by remote control before.

The former record holder was Mobil Oil Co.'s 50-well system for SACROC in Scurry County, Texas (OGJ, April 17, p. 92).

The Gulf system, unlike Mobil's, will be operated from a central office several miles from the field.

The system, using transistorized electronic components, will gage tanks, read meters, sound trouble alarms, and test wells. Tests can be made either selectively or according to a programed schedule.

Gulf has installed 14 "satellite" test stations for the 148 field wells, and the test stations are linked to three consolidated tank batteries. Test data from the satellite stations is transmitted to the consolidated batteries, from which it is transmitted to the central office at Kermit, Tex., as required by the operator.

The system permits 24-hour well tests on each of the 148 wells within a 12-day period. Previously this work was done manually for each well.

Before putting the system into operation, Gulf ran a pilot test on a 12-well lease about 5 miles from the Kermit office. Eventually these wells will be tied into the larger system to make a 160-well hookup.

Odex Engineer Co., working with International Controls Corp., both of Houston, designed and manufactured the system to Gulf's specifications.

Control system for Alberta-U. S. line to be "most automatic"

THE California-Alberta line will have a control system with more automatic techniques than any other gas pipeline.

The system is being designed with an eye toward possible computer control through the use of solid-state circuits that are compatible with modern general-purpose digital computers.

Each compressor station will have local automatic control with remote supervision from a single control center. The control center will telemeter the set point to each station.

A primary and secondary control loop will be in each station. The primary control loop will maintain discharge pressure through engine-speed controls and number of units on the line. Secondary controls will keep engines at or near rated torque.

The contract for the control system has been awarded to Dresser Electronics, SIE Division, by Bechtel Corp. and Canadian Bechtel, Ltd., contractors on the 1,400-mile line being constructed for Pacific Gas Transmission and Alberta Natural Gas Co.

The control system will be for a 721-mile section of the pipeline in the U. S. and Canada. The Canadian portion is in British Columbia. U. S. portion extends from the U. S.-Canadian border through Idaho, Washington, and Oregon to the Oregon - California border. The main control center will be at Spokane, Wash.

SIE says this is the first contract to give the supplier complete control-system responsibility. The cost of the system is nearly $500,000.

The system has these other features:

PROCESSING BRIEFS

A four-grade motor oil has been developed by the research and development staffs of Standard Oil Co. (Ohio). The new lubricant has the desirable characteristics of SAE 5W, 10W, 20-20W, and 30 grades, the announcement said. Three-grade motor oils already on the market contain SAE 10, 20, 30 grades.

A new Udex extraction unit has gone on stream at Plymouth Oil Co.'s Texas City, Tex., refinery. Capacity is about 5 million gallons yearly of benzene, 12 million gallons of toluene, and 14 million gallons of virgin mixed xylenes and ethyl benzene.

A sulfuric-acid plant, using hydrogen sufide and recovered sulfur

All stations will have panels that will sequentially start, stop, and load the compressors.

Supervisory equipment will continuously scan all remote points. Updating will require less than 2 minutes. Communications will be by microwave.

Maintenance will be simplified by modular construction of electronic circuits and built-in marginal test circuits. A standard universal test instrument will allow personnel with a minimum of electronics knowledge to maintain the system.

Honolulu Oil sale finally wrapped up after lengthy delay

THE SALE of Honolulu Oil Corp. was closed last week ending months of negotiations, a brief flurry of opposition from the Justice Department, and weeks of delay in getting a tax ruling from the Internal Revenue Service.

In the $362 - million deal, Pan American Petroleum Corp. paid $289.8 million for Honolulu's properties outside California and Tidewater Oil Co. paid $71.9 million for the California holdings (OGJ, June 12, p.95).

The deal includes production payments totaling $270 million.

Biggest helium plant slated

Kansas operation will produce billion cubic feet of helium yearly. Government will take entire supply.

PLANS for the world's largest helium plant at Liberal, Kans., were announced last week by Panhandle Eastern Pipe Line Co. and National Distillers and Chemical Corp.

The operation will process a billion cubic feet of natural gas daily and will produce a billion cubic feet of helium a year.

The U. S. Government has signed a 20-year contract to buy all of the plant's production for $11.78 per M.c.f.

This is the third such deal made in recent months for the valuable space-age gas.

Cities Service Co. and Northern Natural Gas Co. earlier received the government go-ahead to build plants (OGJ, Aug. 28, p. 42).

These three plants represent 60% of the total helium originally planned for purchase by the Interior Department under the Government's new helium - conservation program. Under the presently reduced budget, they represent 80% of the total.

The plant's crude product (about 60% helium) will be transported through a pipeline to be built from Northern Natural's Bushton, Kans., plant to the Government storage field at Cliffside, near Amarillo, Tex., (OGJ, Oct. 9, p. 72).

The Bushton plant is now under construction, and bids will be asked soon for building of the pipeline. The new line will operate under pressures up to 1,800 psi. and will cost $1,200,000.

The Panhandle-National Distillers plant, located on the Panhandle pipeline system, will be built by a jointly owned company, National Helium Corp., at a cost of $25 million. Construction is scheduled to start in mid-1962 and the plant will be on stream within 2 years.

The companies say their helium plant will be the largest cryogenics-processing operation in the world. Facilities will include three 10-story cold boxes providing 20,000 cu. ft. of freezing space.

Helium will be extracted at −300° F. from natural gas flowing into Panhandle's main compressor station at Liberal. The gas is estimated to contain about 0.4% helium.

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as raw materials, will be built near Hobbs, N. M., for the Climax Chemical Co. Leonard Construction Co., Chicago, has the contract for engineering and construction of the 150-ton-per-day plant. Completion is expected in about 7 months.

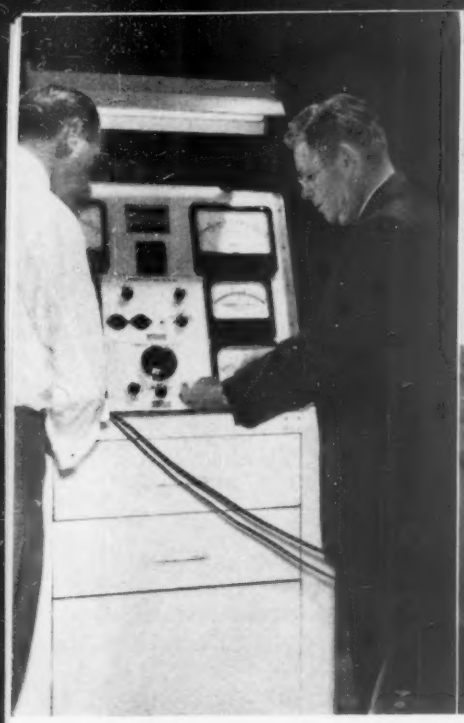
Bell Oil & Gas has completed revamping the Ben Franklin refinery at Ardmore. All crude that was formerly handled at Bell's Grandfield plant will now be processed at Ardmore, and Grandfield will be converted into a terminal for asphalt and other products.

New facilities for manufacturing methyl isobutyl ketone (MIBK) will be added at Humble's Linden (Bayway), N. J., refinery. MIBK is used in making lacquers, organic coatings, and adhesives, and is used in lube-oil dewaxing processes. The new plant is expected to be on stream by the middle of 1962.

Four 7,500-hp. gas turbines will drive compressors in Tenneco Chemical Co.'s petrochemical complex under construction on the Houston Ship Channel (OGJ, Jan. 9, p. 47). Two of the turbines will drive raw-gas compressors in the acetylene unit. The others will drive air compressors in the oxygen plant that Hydrocarbon Research, Inc., will build on Tenneco Chemical's property (OGJ, June 19, p. 63). General Electric will furnish the turbines.

A carbon monoxide boiler will be added at Humble's Linden (Bayway), N. J., refinery. Rated at 400,000 lb. of steam per hour, the boiler will be fed combustion gases from a fluid cat cracker. The gases will contain 9% carbon monoxide and will have an inlet temperature of 1,050° F. It is estimated that less than 10% supplementary fuel will be needed. Foster Wheeler will design and construct the unit.

New propylene storage cavern is under construction at Sun Oil's Marcus Hook refinery. Sun already has three underground caverns, with combined capacity of 900,000 bbl., in operation at the plant. Cost of digging the new 75,000-bbl. cavern will be about $500,000 with an equal amount of pumps, pipelines, and aboveground tankage. Floor of the cavern will be in granite 420 ft. below the surface. Fenix & Scisson, Tulsa, is handling construction.



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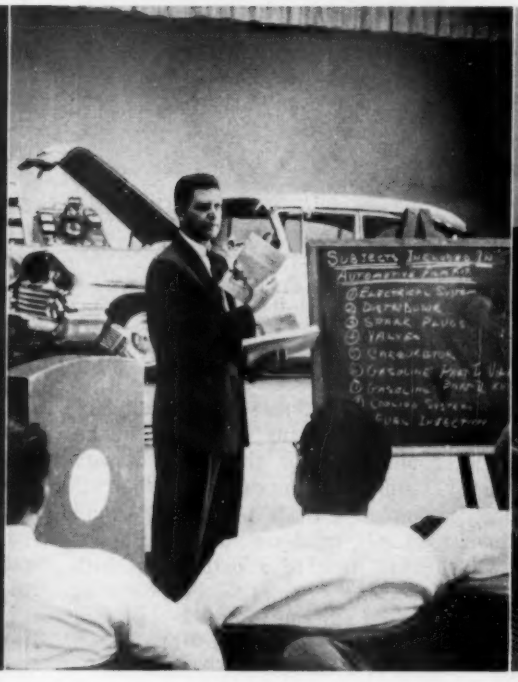

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Iraqi oil mess likely to get worse

Collapse of "final" oil talks between IPC and Kassim's government leaves little hope of smooth relations in future. Iraqis aren't expected to nationalize industry, but there's a move afoot to create a government firm.

"THESE fellows can ask for somethin' new faster'n you can say yes," a weary veteran of postwar oil negotiations said recently when he referred to Middle East government's demands on companies which produce their oil.

A team of men representing the top five oil companies in the world paraphrased that comment—in much more formal language—last week as they packed to leave Baghdad. A series of talks over a 3-year period with the revolutionary government of Gen. Abdul Karim Kassim had reached an impasse. The "final" talks came to an end with Kassim warning the western oil men he has prepared "legislation" to limit future operations of their companies in Iraq.

The western negotiators flew back to London to wait for the other shoe to fall. They don't know what Kassim plans next. but they said they can't accept his current demands, "particularly since experience over the last 3 years has been that acceptance of the demands of the government was not a step toward a settlement of outstanding differences but merely a starting point for a new series of demands."

Kassim has accused the company men of failing to agree on any demands of the government during the last 3 years.

In the hiatus that follows the end of the talks two things appear probable:

A limited future for Iraq Petroleum Co. and its two affiliate firms in Iraq. Kassim has already halted all exploration outside estabilshed producing areas. There is little fear of outright nationalism. Kassim needs, and needs badly, the revenues he receives from oil (an estimated $266 million this year). Kassim could probably take the oil (an average of 968.500 bbl. daily through September), but he couldn't market it.

Iraq's Premier Kassim
. . . a hardheaded trader.

A new national oil company for Iraq, presumably to operate in the country outside the areas already established as productive by the IPC companies. Such a company would certainly need outside help, either in the form of a partnership with experienced exploration concerns or outright aid and technical assistance like the Russians are offering a number of undeveloped countries.

The foundering negotiations. The series of conferences which IPC started with Kassim's government in August 1958 were actually only a continuation of talks already started with the government of King Faisal, who was killed in the revolution which overthrew his regime.

In the 30 separate meetings held since that time, the demands made by the Iraqis have varied, both in content and intensity. The intensity began to build about a year ago when Kassim himself took over as the head Iraqi negotiator. Since that time IPC may often have had the feeling that it is solely responsible for all the ills suffered by Iraq's frequently faltering "revolution."

The Iraqi strong man has shown consummate skill in using the negotiations with western oil men as a prime propaganda weapon for internal consumption. His demands for "the full rights of the Iraqi people" helped prop his tottering image as the savior of Iraq. On at least two occasions he released full transcripts of the supposedly private conferences to the Iraqi radio and daily press. In each case Kassim emerged as a reasonable fellow just trying to obtain the rights of his people.

1. The big differences

Until last week there were only three major points of disagreement. Nearly everyone conceded that a dozen other minor points could be resolved. The "big three" were:

Relinquishment of a large part of Iraq now held by the three companies under their original concessions, which still have 40 years to run. This was the least important of the three. The companies agreed, more than 2 years ago, to give up a large part of their concessions. The method and timing of the turnback was about all that was in dispute right up to the last.

A 20% share in IPC for the Iraqi Government was one point that Kassim insisted upon after he actively entered the talks. His insistence on this point grew with each succeeding talk. It is evident that the company offered him a compromise during those final talks that would have given him a 20% interest in certain new ventures and activities planned by the IPC group of companies, but not all of them.

A Kassim demand for more than half of the profits. This was really the straw that broke the camel's back. The company representatives have told the Iraqi Government all along that they would not agree to breaking down the 50-50 profit-sharing principle in their 1951 agreement with the government. They said the present condition of the world's oil industry makes it impossible for them to agree to less money "per ton" than the companies now receive for the oil they ship from Iraq.

The final breakdown. After a 5-hour session on October 11, Kassim called a halt and issued his warning that IPC will be limited in its future operations. He did not elaborate, but 3 days later Mohamed Salman, Iraqi oil minister, announced a new national company is in the process of being formed.

During that last session, Kassim made what he called his final offer. He demanded that the participants in the IPC group give up 90% of the concession area immediately. He demanded new terms from each company more favorable than the present 50-50 profit-sharing principle. And he demanded that the Iraqi Government have a 20% interest in all future operations of the companies in the areas each would keep. These areas would be outside present proven fields.

2. IPC's position

When the talks broke down, the IPC group reversed the policy of silence it has maintained throughout 3 years of negotiation and made a statement. The company complained that nothing had really been settled in the 3 years of talking, but that the list of Iraqi demands grew all the time.

IPC pointed out that Kassim promised the rights of the companies would be protected when he came to power after the revolution. On the strength of this promise, IPC said, the companies spent $280 million on facilities needed to double Iraq's output of oil. The agreed figure was to be 70 million tons a year or 1,400,000 bbl. daily.

IPC says the government agreed verbally a year ago to a company proposal that the concession area be reduced in a 3-stage program over a 12-year period with the companies eventually giving up 90% of the area under their original concession agreements. In the meeting, the Iraqis demanded that this be shortened to a two-stage program over a 7-year period. In June, the companies agreed to the "hurry-up" demand of the Iraqis. In the last meetings, IPC says, the Iraqis demanded that the entire 90% be given up immediately.

After the August meeting, the company representatives — led by H. W. Fisher, director of Jersey Standard, and F. J. Stephens, chairman of Shell Transport and Trading—returned to London to prepare detailed documents for Kassim. These were presented to him early in October, but further meetings were delayed to give the Iraqis a chance to study what they called "bulky documents" presented by the companies. Authoritative sources have described the company memorandum as "really very brief and to the point."

IPC made the essence of the memorandum public last week. In the document, the companies have set out the financial and economic problems that "inevitably face any company seeking to dispose of large quantities of oil in world markets today."

The memorandum deals with excess capacity and the effect of competition in depressing oil prices. This has led to heavy discounts off posted prices and hampered the companies in their efforts to earn enough to finance the heavy investments needed to provide outlets for the crude oil they are producing.

"The industry's earnings from all its operations in the Eastern Hemisphere were less than the government's 50% share of the profits attributed to the production operation alone," the memorandum says.

3. National company next?

Before the IPC negotiating team had left Baghdad, the country's oil minister announced publicly that "statutes" for a national oil company are being prepared.

Oil Minister Salman gave no details, but it is widely presumed that such a company would explore and try to develop the areas of Iraq which the country is now certain to force IPC to give up.

Iraq already has a national oil entity with limited operations. The Oil Refineries Administration has operated the 48,000-bbl.-daily refinery at Daura and a 12,500-bbl.-daily plant at Khanaqin for some time.

The Khanaqin topping plant is located near Naft Kaneh field. It reverted to the Iraqi Government when British Petroleum Co. gave up the field operation in 1958 under terms of a 1951 agreement with the government that the company would pull out unless it reached 40,000-bbl.-daily production. The field now produces about 4,000 bbl. daily.

Selling problem. Iraq has traditionally been the only Middle East producing nation that has made an effort to take its 12½% royalty in oil rather than cash. But Iraq has never made the grade. The country has on numerous occasions tried to find a market for this royalty oil, but with a notable lack of success.

This same problem would certainly face a new Iraqi national oil company if it did successfully establish its own production in the country.

Gulf keeps up hot drilling pace in Libya

AN "A TO Z" drilling program is nearing completion on Gulf Oil's Block 66 in Libya, but rigs will keep right on making hole.

The company, which labeled its first wildcat on the concession as A1-66, is now drilling on Z1 after drilling completely through the alphabet. Only exceptions were the "Y" test, which has yet to be drilled, and "W," which was skipped because the test might be confused on maps with a waterwell.

Gulf has now started its second round of drilling with AA1-66. This turned out to be an "A-1" well with a flow of 600 bbl. daily of clean 40.3°-gravity crude. It is the eighth discovery on the 11,000-sq.-mile block, where tests have been widely scattered, in some cases as much as 150 miles apart.

Arab Oil Congress starts in low key

Billed as technical meeting, Alexandria get-together of Middle East producing countries lives up to its agenda in the main. But calm atmosphere of affair doesn't mean sharply different viewpoints have been reconciled.

By Fred G. Thackeray

DECEPTIVE CALM pervaded the first days of the Third Arab Oil Congress.

With more than 500 of the 600 listed delegates gathering in conference rooms, corridors, and lobbies, the student union building in Alexandria was a hive of activity. Rumors and counter rumors abounded.

Politics and oil in the Middle East are virtually synonymous, and a get-together of the top names in the world's main oil-producing countries usually produces heated discussion. This heat didn't emerge in any of the early sessions. The meeting, in fact, bore some resemblance to the technical congress it was billed to be.

Odds were that the whole congress could end without a major flareup between the producing-country delegates and the company representatives. But behind the handshaking and friendly courtesies, basic differences of viewpoint remained.

The inaugural meeting showed this. Mixed with the welcoming speeches was the remark by Dr. Aziz Sidky, Egyptian Minister of Industry — speaking for President Nasser—that "there are some agreements concluded in the past under pressure of imperialist considerations. These are no longer a suitable basis for sound cooperation. It is only fair and just that Arab oil-producing countries should obtain a reasonable share of the profits."

Statements like these contain no special venom. It is simply axiomatic among government delegates that existing concession agreements perpetuate injustices on their countries despite big changes in their favor which have been made in recent years.

It was significant that the political and economic sessions met first every morning while two technical sessions running simultaneously shared the late afternoon activity.

Concessions paper. The first paper of the congress was a discussion of arbitration as a means of settling disputes about the terms of concessions. A scholarly presentation by Dr. Mohamed Talaat el Ghouneimi, assistant professor of international law at Alexandria, it left most delegates not quite sure whether the speaker was for or against arbitration.

M. A. Alawarr of Kuwait's Department of Finance gave the congress his long-term look at the prospects for Middle East crude in general and Kuwait's in particular. The Kuwait study used statistical curves to determine the future producibility of the area based on assumptions of ultimate oil reserves yet to be found.

Alawarr estimates that another 175 billion barrels of recoverable oil will be found in the Middle East. He drew the conclusion that peak production of 3½ times the current 5.5 million barrels daily will be reached about the year 2000. This would be, he says, about half of the total world production that year.

He assumes Kuwait's ultimate recoverable reserves to be 120 billion barrels. If Kuwait keeps it present share of some 30% of Middle East production, Alawarr says his country's peak production also will be reached in the year 2000.

It was typical of the general tone of the congress that the Kuwaiti's paper drew only a congratulatory comment from the audience. No one was ready to comment even privately on the validity of his conclusions.

Criticism raised. The only critical paper by mid-week was one presented by a Lebanese delegate. This paper scored individual Arab countries for going it alone in the petrochemical business.

Dr. Mounir Attiyeh, director of the institute for industrial research in Beirut, told the Arabs that individual petrochemical ventures such as those planned or under way in Kuwait, Egypt, Saudi Arabia, and Iraq are doomed to failure.

Instead, he said, the Arabs should be forming a common market in petrochemicals manufacture. His view is a marked departure from agitation at previous oil congresses urging producing countries to start their own petrochemical industries.

Just why this congress started out so differently from those held in previous years was difficult to nail down. The optimistic hope of oil-company representatives was that this "new-fashion" congress would be a forerunner of really worthwhile technical congresses in the future. Such meetings would enable producing-country delegates and company people to discuss technical problems to mutual benefit. But it is doubtful that the subdued quality of this meeting is any real guide.

A whole set of special circumstances surrounded the meeting. Major crises have hit the Arab world three times in the past few weeks. The breakdown of the IPC-Iraq Government talks, Syria's defection from the United Arab Republic, and the Iraq claim to Kuwait have all made political headlines. These events completely overshadowed the Oil Congress in the local press.

At the same time, Arab delegates looked on the meeting as a curtain raiser for the meeting of the Organization of Petroleum Exporting Countries in Iran's capital on October 28. There will be a general meeting of OPEC delegates there. Trinidad has definitely applied for membership in OPEC. Other countries, including Indonesia, are interested but Trinidad is actually on the membership agenda.

Shaikh Abdullah Tariki, oil minister of Saudi Arabia, and his American legal adviser, Frank Hendryx, furnished some of the fire and excitement at previous congresses. Both were scheduled to present

papers late last week, but at midweek Tariki was still in Cairo.

The Tariki paper was in the hands of delegates. It is obviously much milder than his previous onslaughts against the oil companies. His subject: Utilization of the enormous volumes of natural gas now being flared in the Middle East for lack of markets. Chockful of facts and figures, Tariki's paper seeks to show that the advent of refrigerated transport for both natural gas and LPG will make it possible very soon to sell large quantities in Europe.

Russians prepared. Unexpected things happened at previous congresses. Last year at Beirut, E. P. Gourov, the Russian representative, broke into the middle of a session to present the Russian Government's viewpoint on the oil industry. Gourov was not in Alexandria this year, but other Russians were and they had a paper ready to present if they got a chance to do this.

The Italian Government's Ente Nazionale Idrocarburi had a big delegation staying in a luxury hotel on the grounds of ex-King Farouk's palace. Enrico Mattei, controversial head of ENI, was reported to be in Egypt himself, but he was not at Alexandria in midweek. Mattei was reported to be in Cairo talking to the Egyptians about how much oil he takes from the Italo-Egyptian producing operation on the Sinai Peninsula. There was no ENI paper on the official agenda, but the Italians had one ready to offer.

With the sole exception of Iran—invited but not present—every major crude producing country had some representation.

Austria may lay crude line to Trieste

Private companies, Italy's ENI proposed as part owners of 320-mile system.

A 320-MILE pipeline from Trieste to Vienna may be the next major crude system built in Europe.

A pipeline-study company set up by the Austrian Government has recommended the project over possible alternative connections with a pipeline from Russia or a privately-owned system being built into Bavaria.

The report recommended the system's ownership be divided between private companies, Italy's ENI, and the Austrian state oil agency, OMV. This probably means that room will be made for Mobil and Shell, which now refine and market in partnership with OMV through a jointly-owned company, Roholverwertungs G.m.b.H. The interest of the various partners in the pipeline project has not been determined.

The $33.6-million line initially would move 20,000 bbl. daily into Vienna, with expansion later to 40,000 to 50,000 bbl. daily. This volume of crude will be needed to offset a 15 to 20% annual rise in demand in combination with declining crude production. Domestic output of 45,000 bbl. daily at present is expected to go into a terminal decline in 1963 because of a lack of exploration success since World War II.

The country already imports about 22,000 bbl. of products daily to make up the difference between local consumption and production. War reparation shipments of 10,000 bbl. daily now being made to Russian satellites will end in 1964, but this volume of crude will not be enough to solve the shortage.

Alternate connections. The pipeline study vetoed a 40-mile link from Vienna to Bratislavia, Czechoslovakia, which would tie Austria to the 2,500-mile big-inch pipeline under construction from Russia's Second Baku. The reason for the turndown is Austrian fears of becoming too dependent on Russian oil.

An extension of a private pipeline now being built from Karlsruhe to Ingolstadt, Germany, has not been ruled out. But it is considered second best in comparison with the line from Trieste.

If the study recommendation is acted on, the project will replace two earlier proposals for pipelines from an Adriatic port to Austria. The first proposal was made 2 years ago by the Barnabas Group which proposed a system from Venice to Munich, Germany.

Enrico Mattei, head of ENI, since then has proposed a Trieste-Vienna pipeline controlled by his agency (OGJ, July 17, p. 65).

Venezuela optimistic about 1961 oil profits

Perez Alfonzo predicts both government and private companies will get break this year. Cheery forecast is offered in reply to oil minister's critics.

A PREDICTED 2.8% increase in Venezuelan production this year should give both the government and the companies operating there a better break.

At least that's the prediction of Dr. Juan Pablo Perez Alfonzo, Minister of Mines and Hydrocarbons. Perez Alfonzo, under increasing fire from within his own country because of his restrictive oil-industry policy, is trying to combat this fire with optimism.

He predicts:

Government income from oil will increase 8% for the year 1961, with Venezuela's total take reaching 2,766,000,000 bolivars (about $895 million based on special conversion rate applied to oil—3.09 bolivars equal $1).

Private companies will earn 14% on their investment (compared with 11% last year), which the minister says will mean an added $42 million in profits for the companies. Perez Alfonzo estimated company profits for the year at 1,375,000,000 bolivars (about $445 million).

A 2.8% increase in production over 1960 will make both possible, according to the oil minister. He predicts this year's daily production average will be 2,899,000 bbl. The 1960 increase over 1959 was 2.7%, and the minister has repeatedly set Venezuela's goal at a maximum yearly increase of 4%.

In citing these figures, Perez Alfonzo told a Caracas press conference rather plaintively that he cannot understand why anyone can say the industry is in a state of decline when "production keeps going up, costs are going down, and reserves increase every year."

He said the 252 wells completed in the first half of this year were "far superior" to the wells drilled in the same period of last year, but did not elaborate on this any further.

Kuwait to share in Rhodesian refinery

KUWAIT National Petroleum Co., controlled by the Kuwait Government, will have 5% interest in a $28-million refinery to be built by American Independent and other companies at Umtali, Rhodesia.

F. S. Owen, minister of commerce and industry for the federal government of Rhodesia and Nyasaland, said recently an agreement has been reached on all points by participants. But the final decision has been delayed to permit Rhodesian and Portuguese railway officials in Mozambique to work out transportation rates for crude oil. The minister expects final approval of the project by October 31.

Aminoil, which has been handling negotiations for itself and Kuwait National Oil, will have 15% interest in the plant. The remaining 80% will be available to Shell, British Petroleum, and other marketers. But the exact split of the 80% has not been disclosed.

The Rhodesian venture marks the first move overseas by Kuwait National Petroleum, owned 60% by the Kuwait Government. The remaining 40% is held by private Kuwaiti nationals.

FOREIGN BRIEFS

First Ferrofining unit to be built in United Kingdom will replace a clay plant at British Petroleum's Llandarcy refinery near the end of 1962. The process, developed by the company, treats lubricating oils without producing solid waste by-product that requires disposal.

An Italian shipbuilding group is wrapping up negotiations for construction of six 48,000 ton tankers for Russia. The order, reportedly worth about $50 million, will be filled by Fincantieri Corp., the country's largest shipbuilders. The purchase is part of an expanded trade agreement signed earlier this year by Italy and Russia. Increased shipments of Russian crude to Italy are part of the same package.

Russian supertankers are being built at Leningrad shipyards. Several of the 60,000-ton tankers will be turned out during the next 4 years. Each will carry up to 320,000 bbl. of crude or products. Russia's biggest tankers until now have been the "Peking" class, which haul up to 200,000 bbl. of oil.

A Ferranti Atlas computer will be used by British Petroleum to plan integration of its refinery and supply program. The company is paying one-fourth of the cost of the $6 million unit, to be installed at the University of London, and will have use of the device for 5 years.

Two new plants in western Mexico are planned by Pemex. The company is seeking government approval for a 50,000-bbl. refinery and a 30,000-bbl. coking plant. The refinery will be built at Mazatlan and will be supplied with Tabasco crude. The coking plant will be built at Rosarito Beach, near Tijuana. Total cost will be $50 million, of which $34 million in credit will be supplied by French banks.

Drilling site is being prepared on Pemba Island, off East Africa, for a deep wildcat test by BP-Shell Petroleum Development Co. Drilling is to start in December at a location 2 miles south of Tundaua, where a jetty and beachhead will be built.

Crude-distillation unit being designed for use in Russia will process 120,000 bbl. per calendar day and be serviced by not more than five men. Russia says the unit will be the country's largest.

correct timing of frac jobs can improve your profits

More than three years of intensive experience in engineering treatments with the aid of the Frac Guide* has given Dowell engineers an intimate knowledge of how various well characteristics influence results from frac jobs. *Correct timing* of fracture treatments is one of the important lessons learned from this study and experience.

While Dowell engineers are not in the business of reservoir engineering, they *can* help you determine what to expect in the way of payout, folds of increase and treatment costs when you fracture your wells.

The production history shown here of a waterflood demonstrates just one of the many situations where timing of a frac job can be vital to profits.

Notice that the frac program on this flood, which began three years after peak rate of production, resulted in an actual gain of 55,000 barrels of oil. The hypothetical curve shows that the net gain might have been 118,000 barrels of oil if the frac program had been performed 18 months earlier. This would have been 63,000 barrels more than the amount actually recovered.

In addition to increasing recovery, the earlier frac program would have hastened payout and reduced total operating costs. The result would have been greatly increased net profits.

If your decline curves and formation energy records indicate that fracture treatments could help, now is the time to ask Dowell to engineer and compute a treatment program. Don't wait too late. Dowell services and products are available in North and South America, Europe, North Africa, and Iran. Dowell, Tulsa 14, Oklahoma.

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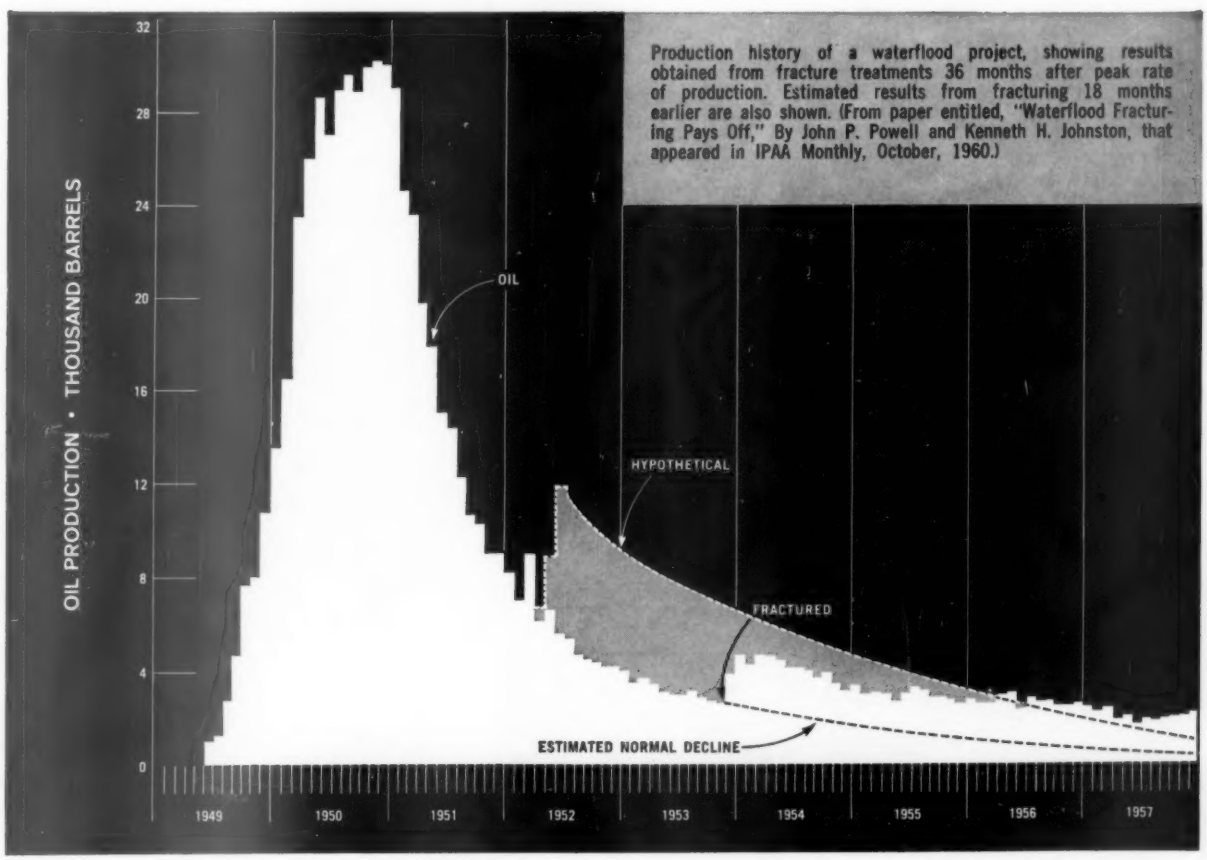
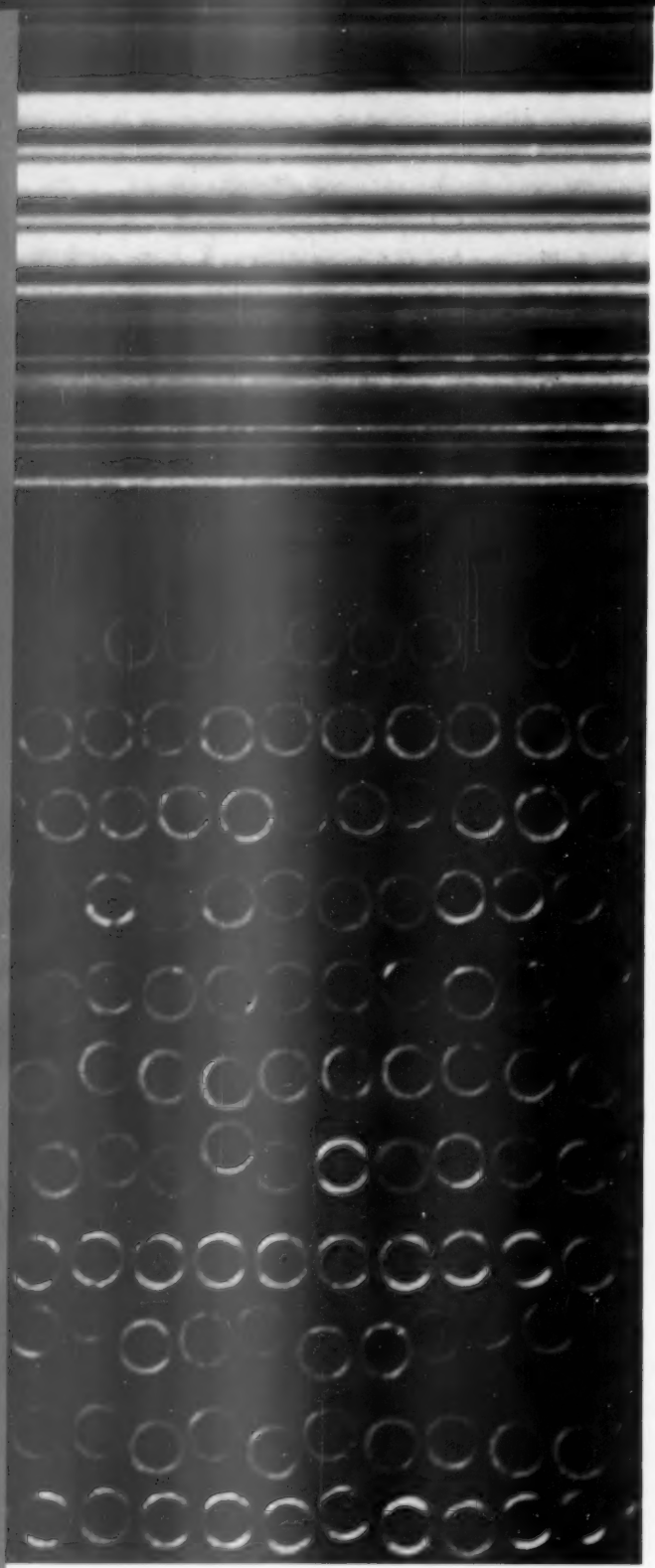


Production history of a waterflood project, showing results obtained from fracture treatments 36 months after peak rate of production. Estimated results from fracturing 18 months earlier are also shown. (From paper entitled, "Waterflood Fracturing Pays Off," By John P. Powell and Kenneth H. Johnston, that appeared in IPAA Monthly, October, 1960.)

Barge shipments en route to Youngstown's four strategic stock points



STOCKS

24-hour service on Youngstown Orange Band pipe from in-transit stocks

CASING. Get all weights in four grades of seamless casing from 4½" through 13⅜" O. D. API (long or short) T&C in H-40, J-55, N-80 and P-110. Youngstown's Buttress T&C, Extreme Line and Speedtite integral joints in J-55, N-80 and P-110.

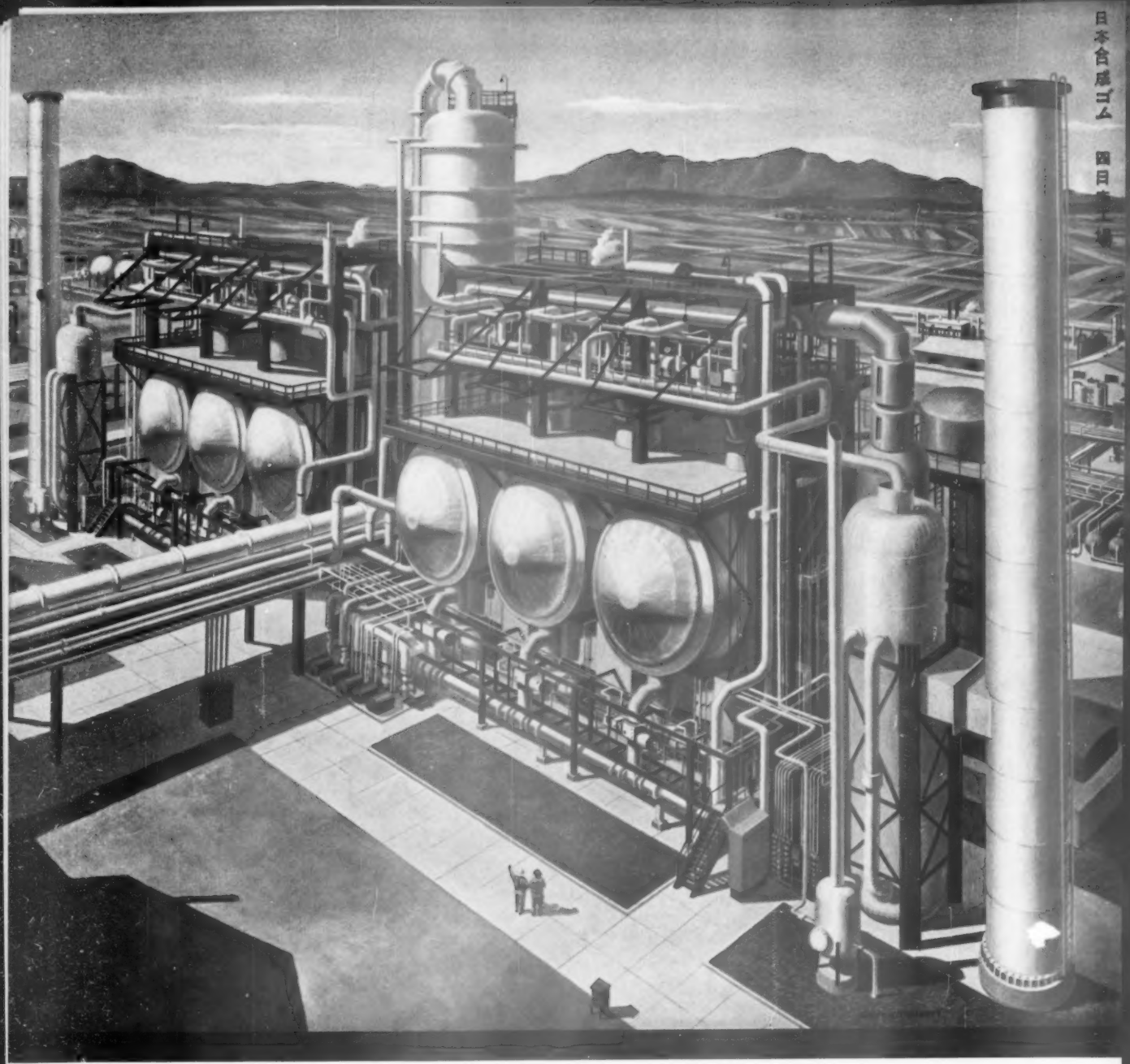
TUBING. Order H-40, J-55, N-80, P-105 . . . threaded and coupled, threads only or plain end, either API External Upset or API Non-Upset. There are special non-API upsets also available.

DRILL PIPE. Grade D, E, plus Youngstown exclusive X-95 and X-105 for low cost top performance in tough deep holes. Get it in standard and light weights, sizes 2⅜" to 6⅝" O.D. Choose plain end or threaded with internal, external or internal-external upset, all compatible with all tool joints.

Youngstown 24-hour service from in-transit stocks and immediate shipment direct from mill stocks mean fast, reliable delivery of Orange Band pipe when and where you need it. And Youngstown backs its quality with the talents of the largest field engineering service team in the Oil Country. Get pipe you can count on. Get the service you want. Order Orange Band Pipe from Youngstown.

Youngstown – growing force in steel

For full details on Orange Band Tubular Goods, write to: Dept. 2-A,
The Youngstown Sheet and Tube Company, Youngstown, Ohio



ONE-STEP BUTADIENE PRODUCTION COMES TO JAPAN

Japan Synthetic Rubber Co., Ltd., is now using the flexible, single-step Houdry Dehydrogenation Process. This new plant, at Yokkaichi, Japan, is the first butadiene plant in Asia. It is designed to produce 25,000 ton/yr of butadiene from butane, using Houdry Dehydrogenation Catalyst. Feed stock may range from straight run butane to complex mixtures from steam cracking operations. Reactors are arranged in two parallel systems which can be operated independently. Versatility of the process allows easy adaptation to efficient production of butenes and other olefins. A complete process description may be obtained on request, from Houdry Process Corporation, 1528 Walnut Street, Philadelphia 2, Pa.

*HOUDRY PROCESSES

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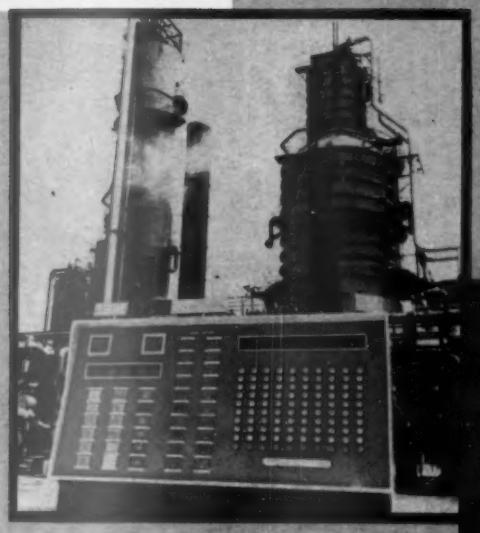
the OIL AND GAS JOURNAL



A SPECIAL REPORT ON

REFINERY INSTRUMENTATION AND CONTROL - 2

By Gerald L. Farrar
Engineering Editor

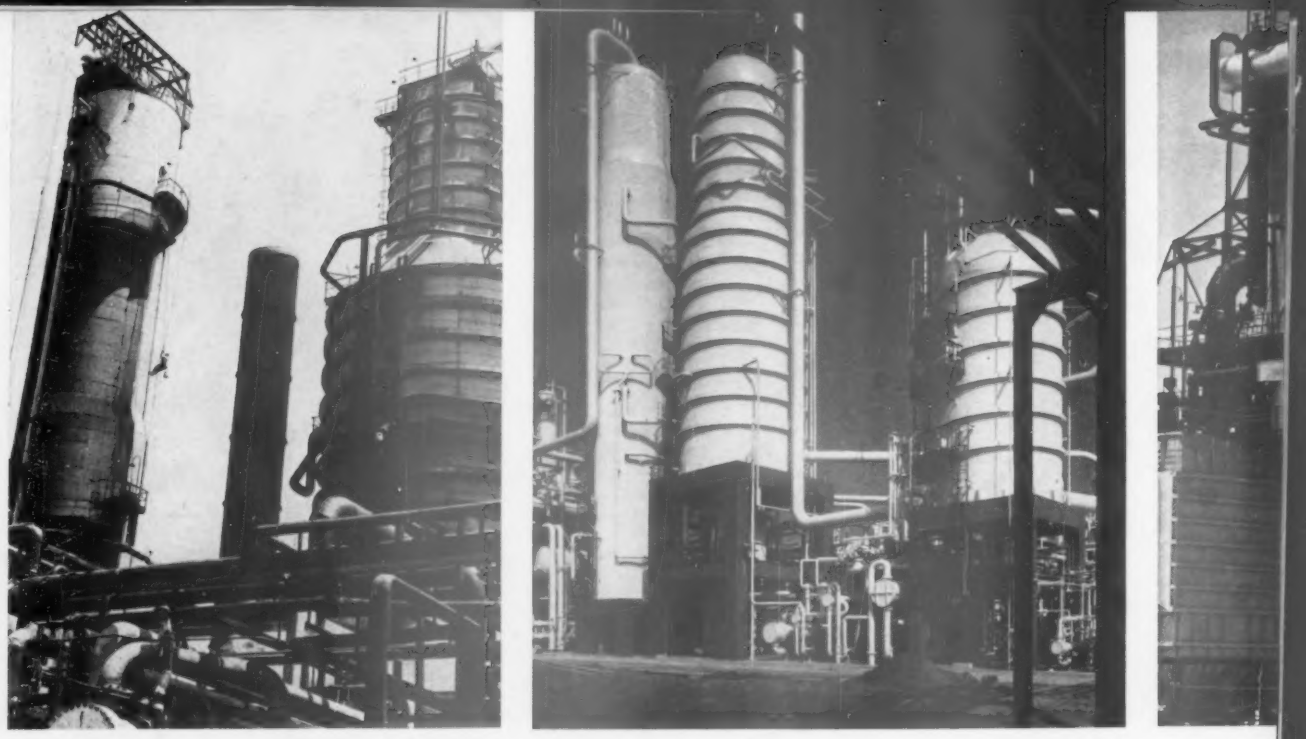
● Recent advances in continuous process-stream monitoring.

● The up-to-date picture on automation progress in refineries, as shown by the status of on-line computer-control-process installations.

These are the areas covered by this progress report on refinery instrumentation and control.

We don't try to cover background and history of these developments in this report; rather, we present the current status of these control tools and techniques, and give an idea of what's ahead.

Actually, we've already given the background. This is the third special report in a continuing series on the subject. First special effort appeared on February 18, 1957, p. 121: "Today and Tomorrow in Process Automation." The second report was published October 5, 1959, p. 127: "Special Report on Refinery Instrumentation and Control—1." If you don't have these, and want to complete your files, contact Reader Service Department, Box 1260, Tulsa 1, Okla.



These three big units are operated more efficiently using

Computer control and stream

WITH OIL surpluses mounting and domestic markets growing more slowly than they once were, refiners everywhere are carefully evaluating their operating techniques to find new ways to improve efficiency and economy.

In such a search, attention is turning more and more to the use of electronic computers for process control and to process-stream monitors for quick, accurate analyses.

Application of computer control on a wide basis seems inevitable. A survey of the companies which manufacture process-control computers shows that business is increasing, including installations, studies, and expressions of interest.

Recently, for example, TRW Computers Co. was working on 18 proposals, 8 of them in the petroleum field. International Business Machines Corp. was working with at least four refiners (in addition to its well-publicized activities with Standard Oil Co. of California and American Oil Co.).

Opinions from refiners and computing companies vary from, "We are on the threshold of things really beginning to open up in the computer-control field, with a surge of activity expected in 3 to 6 months"; to, "Don't expect computer-control applications in great numbers for 2 years, but after that the number will rise sharply."

The majority opinion was perhaps expressed by D. L. McGurk, associate general manager of TRW Computers Co.: "There should be a 40% increase per year over the next few years."

According to McGurk, total control-computer-installation investment will be $14 million in 1961, as compared to $3 million in 1959. Investment in the chemical and petroleum fields has not increased quite this fast. There seems to be greater interest, but less buying. Outlay for control computers in these fields is expected to be $3.7 million this year, while it was only $1 million in 1959.

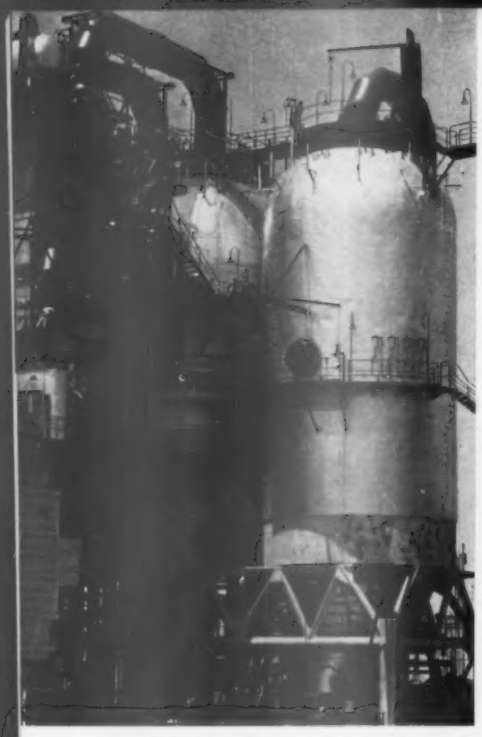
Some predictions call for a total investment of $250 million per year in control computers by 1970.

ON-LINE DIGITAL COMPUTERS FOR CONTROL

MOST ATTENTION in the computer-control field has been focused on digital-computing units, and the most time and money have been spent in investigating the use of on-line digital computers to continually evaluate and optimize selected conditions on an integrated processing unit.

On line means direct connection to conventional instruments and frequent scanning of them, and to special onsite stream monitors which provide real-time analysis of certain streams flowing into and out of the unit.

The computer may be used directly to manipulate the controllers,



AT LEFT, American Oil crude unit. Center, DX Sunray crude unit. Right, Standard of California cat cracker.

analyzers

in closed-loop control, or to guide the operators, in open-loop control.

Where's the payoff? This is the question most refiners are asking, and they want to know how it can be predicted with normal engineering certainty.

American Oil Co. engineers, who have several years experience in this field, say that they can see enough short-range return to offset the capital costs for the first projects. Too, they have confidence that long-range return will more than pay back high developmental costs. Such return, they say, will come from better understanding of processes, acquired partly while preparing the computer - control programs, and partly after such programs are in service.[1]

One refiner suggested that the study for application of computer control can make for as much as 75% of the increase that the computer itself would accomplish. So, he reasons, why not outfit a mobile unit containing stream analyzers,

Digital control computers for refining and other processing

Manufacturer	Model No.
TRW Computers Co., div of Thompson Ramo Wooldridge, Inc. Canoga Park, Calif.	RW—300
International Business Machines Corp. San Jose, Calif.	1620
Daystrom, Inc. La Jolla, Calif.	Specific design for problem at hand.
Minneapolis-Honeywell Regulator Co. Philadelphia	Honeywell 290
General Electric Co. Phoenix	GE 312 GE 412
Information Systems, Inc. Los Angeles	ISI 609
Librascope Burbank, Calif.	Libratrol 1000 Libratrol 500
Westinghouse Electric Corp. Pittsburgh	PRODAC
Radio Corp. of America Natick, Mass.	RCA 110
Bendix Computer Los Angeles	G-20 G-15
Leeds & Northrup Co. Philadelphia	LN-3000
Computer Control Co. West Los Angeles	DDP
Ferranti Electric, Inc. Hempstead, N. Y.	Argus 9
Autonetics Div., North Amer. Aviation Long Beach	Recomp 2 Recomp 3
Packard-Bell Computer Corp. Los Angeles	PB-250

Refining applications, digital computer control

Projects are either formally announced, being initiated, or are on stream.

Company & address	Application	Type computer
DX Sunray Oil Co., Tulsa	Crude distillation	RW-300
Gulf Oil Corp., Philadelphia	Catalytic cracking	RW-300
Texaco, Inc., Port Arthur, Tex.	Catalytic polymerization	RW-300
Universal Oil Products Co., Des Plaines, Ill.	Pilot plant	Daystrom
Universal Oil Products Co., unannounced location.	Refinery optimization	Daystrom
Standard Oil Co. of El Segundo, Calif.	Catalytic cracking	IBM 1620, adaptations.
American Oil Co., Whiting, Ind.	Crude distillation	IBM 1620, adaptations.
American Oil Co., Whiting, Ind.	Catalytic reforming	IBM 704, special.

data - handling equipment, and a small digital computer.

This unit can be moved from process to process, to find out more about each, to set levels of variables, etc. And the mobile unit could return several months or a year or two later to make another evaluation.

This is the approach taken by Phillips Petroleum Co. The Phillips mobile unit is currently evaluating a catalytic cracking process at the company's Borger, Tex., refinery (see p. 121 for more details).

However, most refiners who have made detailed studies in this field feel that the process dynamics of a big refining unit are such that a permanently installed control computer can be justified.

What it means. Computer control of a major processing unit requires 200 to 400 sources of data, including physical measurements, imposed limits, and economic information.[1] Using these data, the control system makes process-engineering calculations at least once per hour, and usually more often, to evaluate operating efficiency and to determine required control action to maximize profit.

In this evaluation, the computer uses a matrix containing 100 or more operating variables.

Since there exists more refining capacity than can presently be used, refiners must justify computer-control expenditures on improved yield (higher percentage of more valuable products from a given crude charge), perhaps at decreased charge rates, or on minimum cost to make the same slate of products.

For separation processes, computer control means closer control of cut points between product streams, and thus increased percentage production of the more valuable products. An indication of the increased profit can be obtained by comparing average performance with best performance.

Evaluation of a catalytic-conversion process is more difficult, because good yield data, lab analyses, and effective plant tests are much harder to come by. By the same token, the computer offers perhaps more promise in these processes because it is in itself a powerful tool for obtaining data, examining it, and developing correlations to make it meaningful.

Computing data logger. Once the ultimate technical feasibility of computer control has been established, the computer can be the vehicle to learn more about the process than has ever been known before.

First use might be as a computing data logger under conventional control. Each bit of new information can then be utilized in making more calculations, until it is possible to close some simple control loops (such as in the feed system of a unit). These closed loops in turn mean better operation and collection of better data on the rest of the system. One refiner put it this way: Bring the instruments into the computer and let it build its own program.

Some feel that the ability to get correct flow rates, temperatures, and pressures; to make good heat balances; and to calculate good operating guides can justify the computer in some instances, whether closed-loop control is ever achieved.

In other words, an on-line control computer can provide more stable, reliable operation of processes than is humanly possible, strictly from an operability standpoint. And this is quite apart from its obviously better optimizing abilities.

The control computer improves safety and at the same time operates closer to equipment limits. Operating limits can be extended with confidence. Production dips and peaks can be minimized, with overall increased production.

This means that many gaps in our knowledge of operations can be filled. Pilot-plant correlations can be checked out, and improved where necessary. This additional know-how may well call for a much different control model than was first envisioned.

Capacity gain. This should be an important factor a few years from now, and even today some units in the refinery are straining for capacity. The prospect of capacity gain, combined with improved yield, is ultimately attractive because one can usually be traded for the other. The control computer will then have another degree of freedom in its optimization work.

Labor saving. There are no benefits to be gained from labor saving, at least now. In fact, the important problem in computer control is not the elimination of the operator, but how to use him in the most effective way. This applies not only to the operator, but also to the process engineer and others assigned to the refining unit. While there is a question as to just what the operator should be doing, the consensus is that we will always want the practical judgment and inherent common sense and sharpness exhibited by the good operator.

Later, a modest saving in manpower may be effected by extending the number of units a given number of operators can supervise. But even then, labor saving will not be a major factor in computer control.

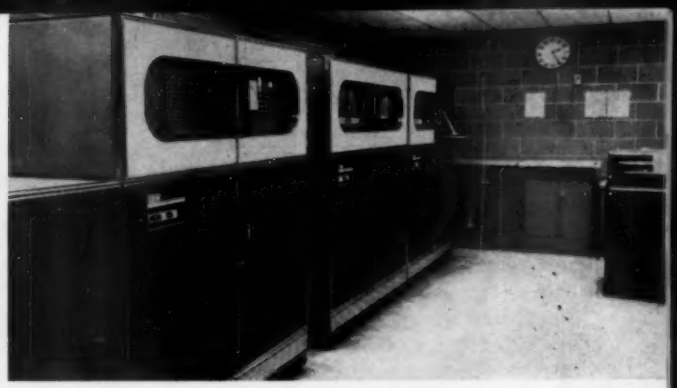
Certainly, at the present state of development, the computer acts only as a supervisory tool that is programed to handle normal plant fluctuations and changes in operating conditions. The operator must be ready to take over during unusual conditions and be aware at all times what actions are being taken by the computer.

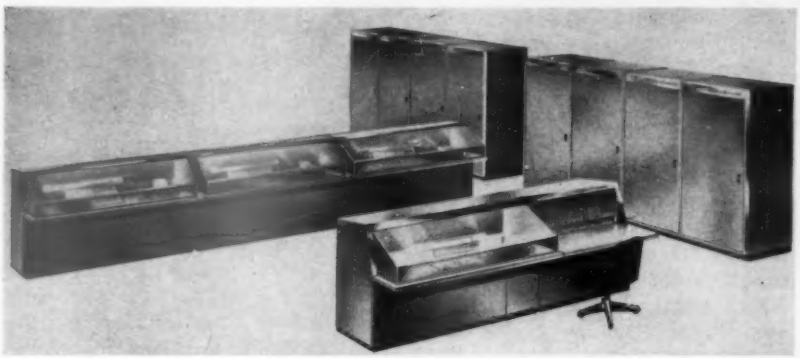
Technical feasibility. Once the economic incentive has been established, computer control can be justified only if the project is technically feasible.[1] This means that the equipment required must be available, and there must be adequate technical know-how to use it.

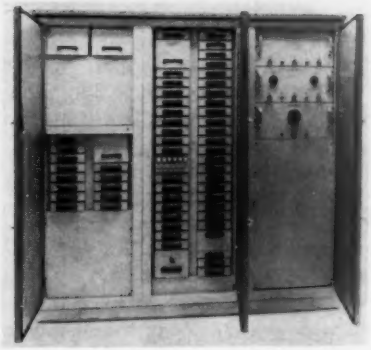
Equipment includes the computer, its input and output systems, conventional instrumentation, and special instrumentation. Technical know-how comes from process engineers who must reduce their knowledge of a process to mathematical description, and from mathematicians who must transform this description into a method for finding optimum operating position.

Reliable computers can be made available in any required degree of complexity for a plant. Very high operating factors are desirable, but are not necessary for closing the loop. The control system can be designed so that computer failure simply means going to conventional control, reliably and smoothly.

Eventually, process units will be designed around the computer sys-







COMPUTER-CONTROL HARDWARE Top left, Daystrom logging console and operator console and control panel. Top right, IBM computer and associated equipment. Lower left, General Electric computing equipment. Lower right, Honeywell 290 unit.

tem, and high reliability will be required. Conventional controllers will be removed from the system, and the computer will be actuating final control elements.

Intermediate vessels will be removed. Every effort will be taken to remove process inertia and lag time. This will enable the computer to change the dynamics of the process and effect even greater savings. Savings in costs of process equipment and conventional instruments will result.

However, it will be several years before enough knowledge and confidence have been gained to eliminate conventional control systems.

Instruments needed. Opinion is somewhat divided on whether successful computer control can be applied in refining before better conventional instruments and stream analyzers are developed. While better instruments would undoubtedly make the control system simpler, and perhaps more accurate and reliable, American Oil Co. engineers have found that conventional instruments are satisfactory, as long as they have repeatability.[1] For example, they are routinely getting material balances within about 1%, using conventional orifice meters and correcting for temperature and gravity.

Additional details on process-stream analyzers are given in the section starting on Page 117.

Process and response models. In developing the control - computer program, two types of models must be developed. The first has to do with operating efficiency, and the second, with response of the unit to controller changes.[1]

The operating model is built on process knowledge of such things as material balances, heat balances, distillation relationships, etc. Usually, the development of this model in as sophisticated detail as is desired calls for more knowledge than is available. Then two courses of action are open. The unit can be put on computer control, using the crude model cautiously and refining it as process knowledge is gained. Or, as American, and Standard of California have done, a general-purpose computer can be used to evaluate plant data, use multiple-regression programs, and develop a fairly sophisticated model before computer control is initiated.

Once the process model is developed, mathematicians must develop the methods for determining the proper changes in levels of process variables to improve operation. This usually is a tough job, because the good process model is seldom linear. Currently, the number of nonlinear techniques is limited, but much work is going on in this field.

Computer programing is made up of comparatively simple operations, but the over-all program is complicated and detailed because it must be complete to be fully automatic. And once the program is complete, a great deal of crosschecking (debugging) must be carried out to make sure the model has been correctly represented and the computer and other control-system components are serviceable and installed properly.

Other uses. The control computer has other uses than to optimize the operation during regular onstream operation. It can be a great help in troubleshooting and maintenance. For example, the computer can determine when a controller has failed and when an instrument has drifted excessively from its calibration point. And it can be used to interpret instrument readings and to calibrate instruments periodically.

The computer can be of great help during startup and shutdown, to carry out operations in a predetermined sequence, to relieve the operator from his logging duties, and to continuously look for equipment failures.[2]

The computer can detect hazard-

ous conditions during startup or shutdown by constantly checking instruments and analyses for dangerous values or concentrations. It can also detect bottlenecks and process limitations during startup, thus paving the way for quick work at these trouble spots.

The alarm announcements and data and trend-recording capabilities of the computer tend to reduce strain and fatigue of plant operators, both during normal operation and coming on and off stream.

When the computer is on the job, reliable process information on the progress of a startup is logged out, ready for analysis and later improvement of both startup and regular operating procedures.

The computer can help in maintenance, too. By storing maintenance history into the computer program, and by continually updating this information as more is learned, the computer can predict when a unit should be shut down for turnaround, what maintenance procedures are necessary to maintain operations for a longer period, and what necessary repairs will be, and in what sequence they should be done.

Computer evaluates payout. The refiner who invests in computer-control equipment first makes every effort to assure himself that he can expect a satisfactory payout. And after the installation, he wants to determine the extent of the improvement. Tools for this evaluation are a mathematical model of the process and actual operating data. Expected benefits can be calculated from the model, while an accurate statistical analysis of the data shows how much improvement has, in fact, resulted.

A small percentage improvement can mean considerable savings. Therefore, the actual changes in operation must be precisely and accurately defined. Careful statistical analysis will show whether results indicating improvement are real and not due to selection of data or random measurement errors.

The time and care required to make such careful analysis are well worth it.

Project Study Procedure

A computer-control project calls for a great deal of knowledge and a vast amount of effort, both from the refiner and from the computer manufacturer. As a matter of fact, the firms that are making a successful entry into this field might better be called systems engineering and service companies, with delivery of the actual computer hardware sometimes assuming a minor role in the over-all transaction.

Computer control of processes is a relatively new field, and the computer companies for the most part have felt that part of the cost of development in this field rightfully belongs to them. As a result, they have provided some engineering services and computer time free of charge. And they have sold their control packages at less than break-even point, assuming that rightful business profit will be forthcoming when the field is more fully developed.

The various computer companies have procedures for implementing a computer-control project that are generally similar, with some relatively minor differences. Of course, procedures vary, too, to meet the requirements and needs of the refiner who is looking at the possibility of a computer-controlled process.

For example, Daystrom, Inc., has a three-phase study program. A phase 1 study usually takes 1 week and is initiated when a refiner either requests it or expresses interest. This takes about 1 week and results in one of three conclusions: (1) well-defined project, can make a proposal; (2) the project is premature, and nothing is to be gained by going further at that time; or (3) the project is sufficiently developed for a phase-2 study.

The phase-2 study is a paid study which results in a detailed analysis of process requirements, system performance, and new instrumentation to be required, as well as payout studies for economic justification of the system. This comprehensive report is turned over to the refiner for his use in any way he sees fit. He may accept the Daystrom bid or take the report to another computer firm for a bid.

Phase-3 includes the design, construction, and installation of hardware, plus operation followthrough, such as training of operating and engineering personnel, initiating on-line operation, and conducting extended acceptance tests.

After contracting. Once a contract has been written, a great deal of work remains to be done, sometimes the bulk of it. For example, TRW Computers Co. procedure looks something like this, with adjustments made as necessary:

1. Technical people from user and computer companies meet to firm up technical requirements for the computer. One man from each company is assigned for engineering liaison. These two men follow the project to its complete fruition.
2. A team of process engineers make a thorough analysis of the process to determine mathematical relationships and develop a set of control equations.
3. The computer is programed and documented.
4. Installation - site planning is completed, including connection of computer into existing and necessary new instrumentation and control equipment.
5. The computer is installed, and postinstallation engineering is provided.

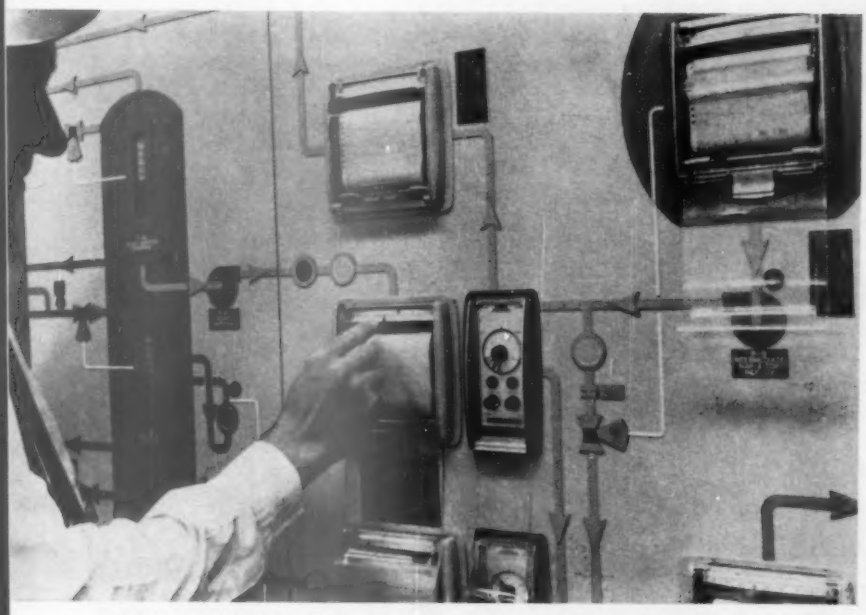
In addition, user personnel are trained, both at the factory and on site, and the user is furnished with programs, program manual and aids, description of routines, and technical description of the specific computer system.

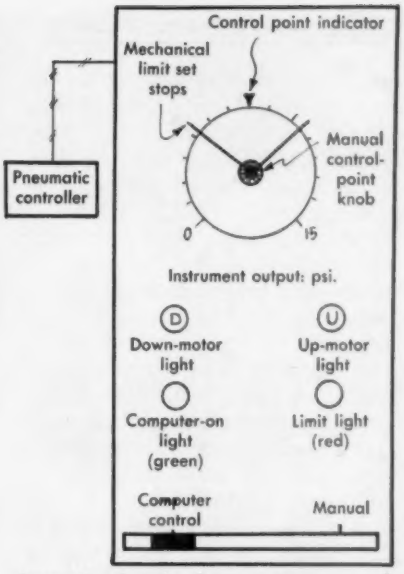
The computer companies will provide engineering and maintenance service for as long a period as the customer desires it. This is a paid service and usually is contractual.

New service. Bonner and Moore has recently added several staff members in the control-computing field. The firm is thus one of the first to offer independent control-computing services.

DIGITAL-COMPUTER-CONTROL INSTALLATIONS

AS THIS REPORT goes to press, there are eight refining applications for digital-computer control, with new projects either formally announced being initiated, or already on stream.





Pneumatic sub-station for computer or manual setting of control point

REVISED FOXBORO SUBSTATION is used to make pneumatic-controller set-point adjustments automatically, or manually if necessary. Fig. 1.

Texaco Cat Poly Unit

The granddaddy of the online digital process-control-computer systems is that of Texaco Inc., at its Port Arthur, Tex., refinery. There, an RW-300 has been in operation since March 12, 1959, on an 1,800-bbl. (product) catalytic polymerization unit.

Best guesses by informed industry men who know computer control and refining are that this unit paid out sometime earlier this year, and that the several per cent increase in efficiency occasioned by computer control now means money in the bank for Texaco. So far, the company has declined to comment on these reports.

Standard process. The Port Arthur unit charges feed containing about 30% propylene to a standard UOP solid-phosphoric-acid catalytic-conversion process. Every barrel of propylene converted to a barrel of polymer gasoline means about $3.50 increase in value. Computer control has been responsible for an improvement in propylene conversion from 80 to 91%.

And there are some plus values, too. Longer catalyst life and decreased processing costs have resulted from closer control of process variables, particularly the three critical ones: pressure, temperature, and flow rate (contact time).

As have most companies which are working in the computer-control field, Texaco has relied on process-stream analyzers to get stream-composition data in real time. Analyses of three gas streams are continually delivered to the computer. Other inputs to the computer include 26 flow rates, 72 temperatures, and 3 pressures.

Controlled variables. Actuated by these signals, the computer makes the calculations called for by its process model and positions set points on pneumatic instruments which control (1) flow rates to each of the 10 reactors in the system, (2) pressure, (3) outlet temperatures for each of two groups of five reactors, (4) recycle, and (5) catalyst-hydration water.

Besides maintaining continuous control over the process, the computer checks the instrumentation, periodically calibrates the chromatographs, and keeps an accurate log of the process variables.

Onstream factor for the computer has been high; availability this year has been over 99%.

American Oil Crude Unit

An IBM solid-state digital control computer, coupled to a large random-access memory storage, is installed at American Oil Co.'s 140,000-bbl. crude-distillation unit at Whiting, Ind. Evaluation tests and program checkout are just about complete, and a preliminary period of open-loop operation should start soon.

After about a month on open loop, engineers expect to start closing control loops and put the big unit on complete computer control, under the watchful eyes of the unit operators.

The installation of the control computer climaxes several years of joint work by IBM and American engineers. An IBM 704 general-purpose computer was used to optimize operations and give the process model a thorough testing before final control installation was designed (see OGJ, Nov. 14, 1960, p. 143 for complete account of this earlier work).

American expects a reasonable payout on the system, and is counting on this and other computer-control systems to help operate refining units in the most economically efficient manner and at the same time maintain uniformly high-quality products.

How it works. The computer reads 220 instruments, including 5 process stream analyzers. These readings are examined by the computer in light of the process model which has more than 500 equations in it. Memory of the unit contains 40,000 stored instructions.

Using linear-programing techniques, 54 dependent variables,

which may be limited by up to 162 constraints, are considered in finding the optimum setting for 19 independent variables. Then the computer adjusts the set points on 19 controllers.

Set-point adjustments are made on the pneumatic controllers by means of a revised Foxboro substation, Fig. 1. The electrical signal from the computer actuates one of two electrical motors in the substation. One motor raises set-point air pressure, while the other lowers it. The computer determines in advance how long the motor should be on and turns it off at the proper time.

The substation also has a knob for manual adjustment of the set point, should the operator desire to override the computer. And he may use a manual-automatic switch if he wishes to completely disregard the computer signals.

The substation has fail-safe and slow-change features built into it. These two problems were among the latest to be solved in paving the way for full online control.

In the event of either a computer or a power failure, the two set-point motors are turned off. The set point remains right where it was when the failure occurred, and the unit goes on conventional control smoothly and easily.

The motors move very slowly, taking about 100 minutes to move through full range of set-point change. If the computer gets into an uninterruptable mode, the motors stop automatically after operating 5 minutes. The computer must then make a complete series of calculations before the motor can again be turned on. As shown in Fig. 1, adjustable mechanical-limit positioners permit the operator to set minimum and maximum limits through which the computer can change the set point. If the computer reaches a mechanical limit, power to the motor goes off, and a red light comes on. The operator can move the mechanical limit, if it is safe to do so.

Operator console. As shown in Fig. 2, the operators are provided with an operator's console. This provides a simple means for making inquiries of the computer and for inserting information into the computer, such as product specification changes or the latest laboratory results. This is done by manipulating sense switches and entering information into a keyboard.

A typewriter on the console and a logging typewriter supply operators with needed information from the computer.

OPERATOR'S CONSOLE at American Oil's crude unit is being connected to about 30 electrical cables that carry signals to and fro from the control computer to the process. Fig. 2.

Stream analyzers. The stream analyzers installed on the unit in some cases feed information directly into the computer. In other cases it is manually entered. The five analyzers are:

- Radioactive density indicator on crude feed (direct entry).
- Viscosity monitor and controller on residual fuel from the unit (manual entry).
- End-point monitor (manual entry) flash-point monitor (direct entry), and distillation analyzers on the No. 1 fuel oil, No. 2 fuel oil, and heavy naphtha products (direct entry).

The computer program calculates ASTM distillations on the products, using vapor rates, liquid rates, heat balances, etc. However, the latest product analyses from laboratory or

the onsite analyzers can be used to revise coefficient in equations. Later, the distillation - stream analyzers may be used directly. Development work is still being done on these instruments.

Currently there are eight professional people assigned to the project to assist in getting over the large initial programing jobs. However, it should be possible to cut this to about three by January 1, when the unit is expected to be operating closed loop more or less routinely. These three men will be needed most of 1962 for further upgrading of the model and adding program refinements.

American Oil Ultraformer

The same process monitoring system used on the crude unit during control-development studies is now installed on one of American Oil's Whiting Ultraformers. This system will be connected with American's general - purpose IBM 704 by a pair of telephone lines. The reformer program will share computer time with other calculations.

Results of the computations will be sent back to the control room by telephone. These values will serve as guides for unit operators.

The first skeleton program is almost ready for operation. When the program is fully developed, American engineers will be able to evaluate fully the processing and economic feasibility of installing a full-time online computer-control system.

Stream analyzers. Six continuous process monitors are installed on the Ultraformer:

- Two gas chromatographs, one on reactor feed and effluent, and the other on recycle and off gas.
- A dielectric - constant instrument, which will be used to indicate reformate octane.
- Three radioactive density meters, one on prefractionator feed, one on reactor naphtha, and one on reformate.

Reactor feed differs from reactor naphtha, in that recycle gas is added to the heart - cut reactor naphtha taken from the prefractionator before it enters the reactors.

One interesting problem that has been resolved in the Ultraformer model is the particular configuration of the unit at all times—which reactor is being regenerated, the flow sequence from one reactor to another, etc.

INSTRUMENT PANEL at the El Segundo refinery of Standard Oil Co. of California has been adapted to computer control. The sign, computer, can be seen just above most of the recorders.

Texas City study. American Oil and IBM are also jointly undertaking a feasibility study of an online, real-time guidance system for American's 150,000 - bbl. refinery at Texas City, Tex.

Such a system would regularly scan the most significant instruments on each of the refinery's processing units, as well as levels in important storage tanks. From this and current refinery economic and product - demand information, the computer would coordinate day-to-day operations to insure that the best over-all refinery products yields are obtained at the lowest possible cost.

Eventually, this could lead to computer control of each unit, perhaps tied to an over-all master computer. The feasibility study is not complete, but results so far look promising.

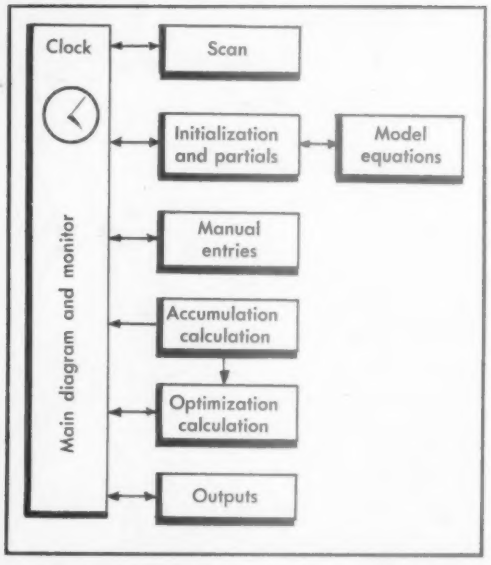
UOP Activities

Universal Oil Products Co. has worked several years with Daystrom, Inc., in adapting computer control to various processes.[3] First work was done with a trailer-mounted general-purpose machine, used successively as data logger, open-loop control, and closed-loop control of pilot-plant installations.

An outgrowth of the pilot-plant work is the development of the Flowcon, a special-purpose digital computer designed for specific control of the UOP Molex process.

Most recent work has been on exploration of the justification of computer - controlled refining installations. A computer has been installed in a small refinery, with initial problem being the optimum blending of seven product streams into two final specification-product streams. Production of the more desirable product is maximized, and at the same time the secondary blend remains on specification. The computer controls split of intermediate product streams by means of a running solution of product quantity and quality equations.

The computer also controls the gas-concentration unit for optimum recovery. Next extension in the program is to control of the fluid catalytic cracking unit, and after that the remaining major refinery units will be brought on computer control.



CONTROL PROGRAM for Sandard of California cat cracker may be divided into six steps. Fig. 3.

A stepwise program was developed, with scanning and logging, model verification, open-loop control, and optimum closed-loop control following in sequential order. The refinery is an existing well-instrumented plant, and the computer control center was designed to fit. A special, centrally located building was built to house the center. Control circuits extend radially from the building to control rooms and processing areas.

Standard of Cal. Work

Engineers from IBM and Standard of California have recently finished checking the program and debugging the custom digital-computer-control system installed on the big 55,000-bbl. Standard cat cracker in the company's El Segundo, Calif., refinery. The computer is now in its first operating phase, scanning, logging, and indicating.

Next step will be closing the loop, section at a time, each section containing one, two, or more related variables. Then, computer signals will change instrument set points.

This computer-control project was developed in a study in which Standard of California used first an IBM 704, and later an IBM 7090, at San Francisco to provide control data to the El Segundo FCC operators 400 miles away. This study indicated that computer control will mean at least a 2% increase in value of products from the unit. And this is considered the amount of improvement needed for the control system to be economically successful.

Computer program. The control program can be divided into six steps (Fig. 3). First, the computer scans the 75 points of information—temperatures, flow rates, pressures, etc.—at an average rate of 40 points per minute. (The computer can scan a maximum of 20 points per second.) This information is stored in the unusually large memory file of the computer (more than 1 million characters).

Second step is initialization—the computer determines the present operating condition of the plant from the scanned data. It then determines how much each control should be changed from its present setting to improve performance without violating any of the plant limits. To do this, it is necessary for the computer to contain a set of equations which is good enough to extrapolate a short distance away from the present operating point, and have instructions stored in its memory to supplement the continuously gathered data.

The accumulations calculation figures the extent of the imbalances in the plant—for instance, heat being generated against heat being absorbed. This procedure was a key result of the development work.

The optimization calculation involves the use of linear programing and includes special features developed for this application. The complete calculation is made on a fixed time frequency, and is also triggered by emergency combinations in the 75 variables.

The scanning and digestion of data occurs continuously; the new results will be calculated about every 15 to 20 minutes in most situations.

Physical installation. Most of the computer control system is housed in a small positive-draft, air-conditioned building about 100 ft. from FCC control room. The physical installation includes the building itself and installation of transducers to (1) convert air signals from the cracker to electric signals for the computer, and (2) convert electric outputs from the computer to pneumatic signals for the instruments.

The FCC operator in his control room will communicate with the computer system through the process operators' console (Fig 4), which has labeled switches and lights. With the console, he inserts new information into the computer's memory, adds modified data on plant situation, or calls for special action from the computer. The results of the computer calculations then reach the operator on a typewriter located beside the console.

The operator can change operating limits as required to reflect changes in equipment performance. He must have this facility because some of the limits are tied to the mechanical condition of the process equipment which can change due to such factors as ambient temperature, aging, fouling, and the like. Some of these changes occur frequently, others over a period of weeks.

If the operator does make a change in limits, he obtains at the end of his shift an estimate of the amount of product value associated with this limit. In effect, he gets a measure of the value of being able to get more performance out of the key items of plant equipment. Since these values change with operating conditions, it is helpful to the operator to have up-to-date numbers

PROCESS OPERATOR'S CONSOLE at the El Segundo cat cracker is located just in front of the instrument panel. With the console, the operator inserts new information into the computer program, adds modified data on plant operation, or calls for special action from the computer. Fig. 4.

supplied by the computer system.

Error insurance. The operator must also have control over certain contingencies and be able to modify the computer behavior as required. For example, one or more of the 75 instrument points which are scanned into the computer may become temporarily inoperative due to equipment failure or to removal from service for routine maintenance.

The operator is able in this case to inform the computer system that the affected instrument is out of service and to indicate whether the computer program should use the last good value recorded in its memory or should use an "override" value selected by the operator.

Another possibility—the operator may wish to get a record of all flow rates or temperatures during unusual operating periods. He can demand this kind of information and have it printed out on the second typewriter in the control room.

Along with this degree of control exercised by the operator comes the problem of providing insurance against mistakes. Built into the computer system is a detailed check-and-balance procedure. Changes made by the operator in the key equipment limits, for example, must pass reasonableness tests which have been determined in advance by plant supervision and recorded in the computer's memory.

If the operator inadvertently makes an entry which does not meet these checks, he receives a message on the typewriter stating that an error has been made and the computer system will not recognize the proposed change. If, on the other hand, the operator has made an entry which meets all of the tests, then he receives a confirming message on the typewriter. This forms a record which is available to the operator within a few seconds and which also is available later to the next shift.

A total of almost 500 messages is built into the system to help the operator get full value from the computer.

In operation, the computer scans the status of the 75 variables, makes recommendations for new settings based on their status, then makes a prediction of what product mix the new settings will provide. It then does another scan and normally would find that the product mix does not quite meet the optimum mix it predicted. So, it then recommends slightly different settings, thus coming much closer to optimum than would ever be possible

without its rapid-fire calculation.

Other work. Standard of California does not plan any more large-scale, online digital-control systems until the El Segundo installation has definitely proved out. Meanwhile, however, work is moving ahead with what company spokesmen call, "data-acquisition" systems.

These systems go beyond data logging as such, in which data are mechanically recorded with little or no calculation. Their purpose is to describe the process model in quantitative terms, so that data may be converted to the form in which they can be examined for economic implications.

This means that it must be suitable for entry into a general-purpose digital computer. Results of data-acquisition studies will be used for planning, control, and process improvement. Laboratory instruments will be used as needed to provide the necessary analytical data.

Data processing and analysis in this manner may mean that computer control of a process is called for, but if so, this will be a logical conclusion from the study, rather than an end in itself or a goal settled on in advance.

New tools available. Standard engineers feel that we now have the tools and techniques necessary for accurate data acquisition and analysis.

Data can be obtained much more quickly and effects which we formerly wouldn't have known existed can now be determined quantitatively. We can anticipate many new developments and extensions of our level of knowledge as the result of these detailed analyses.

One of the new tools is Standard's recently announced printing integrator for chromatographs. This instrument rapidly and accurately integrates the areas under curves drawn by chromatograph indicating pens. Results are more accurate and faster than can be obtained from mechanical devices, such as "peak pickers," say the Standard researchers.

The small, portable analog computer can be very versatile for work on problems handling differential equations and for "small" problems. California Research is getting an Electronic Associates TR-10 unit which will be moved about and used on a commercial unit.

DX Crude Unit

A new 85,000-bbl. crude unit, first to incorporate an online digital-computer-control system in its original design, is now onstream at DX Sunray's Tulsa refinery. First operation of the unit called for the computer to log and scan, while programing and model making were going on. Some of the control loops are now closed, but it will probably be nearly a year before the computer is doing the complete job that has been planned for it.

The control program is based on processing knowledge accumulated by DX, but which had not been applied for control purposes because of the calculation and analysis time involved. The computer is set to control products to specifications at minimum cost or maximum throughput, even with changing crude slates.

The program is not too detailed, in that such things as effect of reflux are not included. These effects are determined offline, and changes are made in the program if needed.

The control system continuously scans 191 process instruments every 10 minutes and can automatically reset 30 control instruments.

Other equipment. In addition to the RW-300 console, two analog input cabinets, two Flexowriter units, three logging typewriters, and the operator's control console and panel comprise the computer-control system. An arithmetic and control unit performs all arithmetic operations from either prestored instructions or from instructions given manually by an operator.

A data-conversion unit periodically samples portions of the computer's memory and converts the information from digital to analog form for measuring instruments. The same unit also converts data received from the instruments into digital form and stores the results in the computer's memory.

Off-limits warning. Limits for the various process variables are built into the computer program, and maximum permissible deviation of each variable from the controlled set point is also stored in the computer. When a variable is discovered outside these limits, a warning is typed in red on the Flexowriter.

Certain variables and functions of them are recorded by the logging typewriters every 2 hours and daily. And the operator can ask for logs, summary statements of out-of-limit variables, or readings from faulty instruments on demand by means of a special control panel. The operator can also request the computer to read new information into the computer memory.

Instrumentation of the unit includes several process stream analyzers, including viscosimeters (lube-oil products), boiling-point monitors (side-stream products), oxygen analyzer (furnace efficiency), density monitors (crude-oil gravity), and chromatographs (overhead-gas analysis).

Payout. A detailed study of the crude unit indicates a 2-year payout for the computer-control system.

Gulf Cat Cracker

An RW-300 computer is installed at the cat cracking unit, Gulf Oil Corp., Philadelphia. The computer program is now being debugged, in preparation for online control of the big 60,000-bbl. fluid unit. The control system has been logging and scanning process variables for approximately 4 months.

The control system will use information on feed-stock characteristics, catalyst characteristics, and market factors to control operating conditions such as reactor temperature and recycle rate to achieve a significant increase in value of products.

Gulf and TRW Computers Co. did the project engineering for the entire project, and a team of process analysts who were familiar with the actual day-to-day operation of the unit also worked on the problem. Gulf correlations were found, after slight modifications, to be suitable for building a mathematical model to represent the process.

Three programers, two Gulf men and one from TRWC, transformed the mathematical model into computer language. These men are chemical engineers, with a background in programing chemical-engineering problems. Nearly 15,000

words of memory were required to write the program.

Three chromatographs are tied into the control system. These will analyze flue gases and various product streams, to obtain a more accurate material balance around the unit.

An exhaustive analysis of the process indicates that the new control system should improve operating efficiency sufficiently to return the investment in a short time. Other expected benefits are better operating techniques and improved plant design.

Tidewater Study

Tidewater Oil Co. has awarded a prime contract to Information Systems, Inc., and C. F. Braun & Co., to conduct a modernization-and-automation engineering study for the Tidewater Avon refinery near San Francisco.

The combined experience, process knowledge, and control-systems know-how of the three companies provide the basis for a unique approach to the modernization, development, and implementation of an efficient refining operation. All technical aspects of the refinery's operation will be thoroughly analyzed, thereby providing Tidewater with complete information on which to base sound decisions for effective and permanent operational improvement.

The scope of the study will be to determine short-term and long-range economic justification for refinery improvements in process engineering, instrumentation and control, communications, maintenance, and other areas of refining.

PROCESS STREAM ANALYZERS

FASTER AND MORE accurate analyses are keys to better control in refining. In conventional control these analyses aid the operator to maintain the process closer to the accepted control criteria, and in on-line computer control the continuous automatic analyzer provides the means to continually reevaluate the process dynamics.

Great strides have been made in the development of these onsite, continuous instruments in the last few years. In fact, in addition to their greater speed, the stream analyzers give better accuracy and reproducibility than laboratory equipment. Contamination of samples can be overcome by using flash pots, dryers, steam tracing, strainers, and other improved sampling techniques.

Contaminants or components within a stream often cause a background which affects the resulting analysis. By using standard samples of similar composition, and adjusting the analyzer to the existing conditions, the background effects can be minimized.

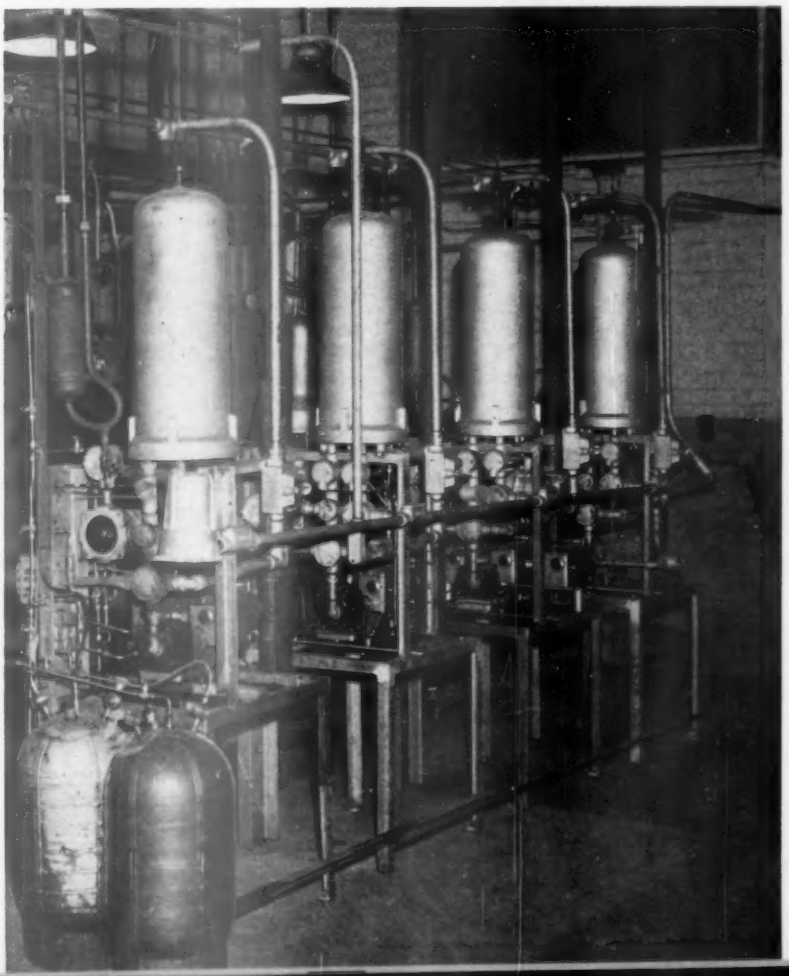
Distillation Instruments

One of the greatest needs for stream analyzers has been felt in distillation processes. Instruments now available for this purpose include vapor pressure, initial-boiling-point, 10% - point, 50% - point, 95%-point, and end-point analyzers. These are augmented by the Hempel, colorimeter, and viscosimeter instruments.

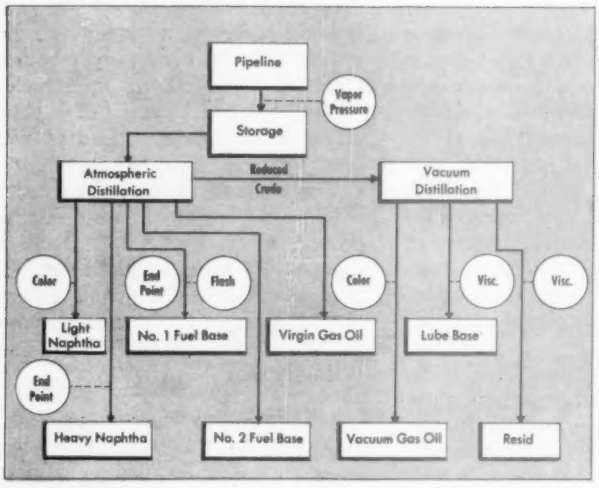
Sun tests. Recent tests at Sun Oil Co.'s Marcus Hook refinery show that the continuous, unit - located analyzers can be more accurate than laboratory instruments[4]. Three of the analyzers were outstanding, with 90% of the readings on the boiling-point-monitoring instruments deviating from the average reading by only 2° F. With one exception, all the analyzer readings were more consistent than the laboratory distillations of the standard samples.

Analyzer installations. Sun's instruments are located on streams from a crude tower. The gasoline fraction is sampled at the pump which returns reflux to the tower, and steam-stripped naphtha, gas oil, and furnace oil are sampled at the pumps which transfer them to storage. Sample loops are kept small, connecting tubing is kept short, and rapid circulation is used in the sample loops.

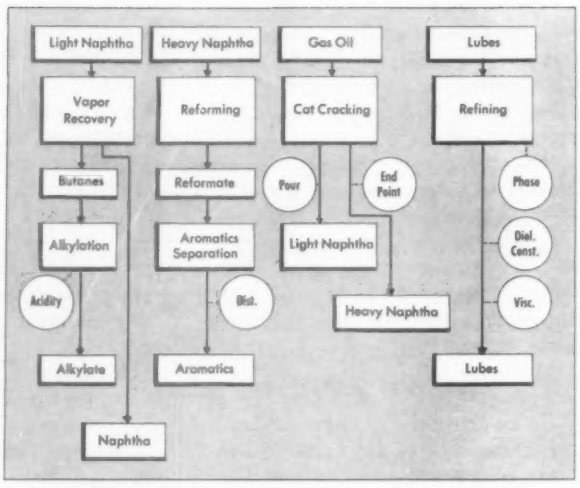
As shown in the photograph to the left, the analyzers are located in a compressor room where they are protected from the weather.



SUN DISTILLATION ANALYZERS are located in a compressor room where they are protected from the weather. The installation is well enginered.



VAPOR-PRESSURE analyzer on crude pipeline shuffles crude batches to the proper tankage at American Oil's Whiting refinery. From here, stream analyzers take over to guard quality. Fig. 5.



CONVERSION PROCESS are held near the optimum operating point at Whiting by various types of monitors which analyze the stream for its most significant variable. Fig. 6.

Test procedure. During a 2-month period, each of the six boiling-point analyzers operated continuously on a stream from the unit. At intervals of 1 to 5 days, the analyzer was switched to a standard sample. A reading was recorded and compared with laboratory results.

The 50%-boiling-point analyzer was used on the crude-tower gasoline stream and on two additional standards which differed considerably from the normal stream. A total of 94% of the analyzer readings were within 2° F. of the laboratory 50% point.

The 90%-boiling-point analyzer was used on gasoline from a catalytic reforming unit. Readings from this instrument checked the laboratory 90% point within 6° F.

The 10%-boiling-point analyzer was checked on crude-tower furnace oil, another furnace oil, and crude-tower naphtha. Results from 29 checks checked within 2° F. of laboratory results.

The crude-tower naphtha stream and four other naphthas were checked by an end-point instrument. Again, all results checked laboratory results within 2° F. A second end-point instrument was checked on crude-tower furnace oil. About two-thirds of the readings agreed within 4° F., and all agreed within 8° F.

The Hempel analyzer read the per cent of the gas-oil stream distilling under 440° F. Results from 12 checks showed that 92% of the analyzer readings agreed with laboratory average Hempel distillations within 0.5% distilled.

Test deviations. A comparison of analyzer precisions with those from laboratory tests showed that nearly all of the analyzer readings were more consistent than those from the laboratory.

American Oil Experience

Automatic flash testers and end-point instruments have increased operating efficiency at American Oil Co.'s Whiting refinery, Figs. 5 and 6.[5]

Vapor-pressure monitors have proved useful in segregating crude batches which have been spiked with butane and casing-head gasoline in the oil fields. High-vapor-pressure batches must be handled differently for smooth distillation.

In crude distillation, maximizing No. 1 fuel-oil production, at the expense of less-valuable products can result in increased earnings. Monitoring instruments permit the flash point to be maintained several degrees closer to the specifications minimum, and end-point analyzers permit increased blending of heavy ends, without exceeding specifications.

Use of colorimeters has reduced the entrainment of heavy ends in vacuum gas oil. And viscosimeters have been so successful in maintaining lubricating-oil specifications that intermediate holding tanks have been eliminated. Viscosimeters have also been used to prevent dilution of vacuum-tower residuals with gas oil, and to control asphalt specifications.

Conversion processes. Automatic end-point control on a catalytic reforming unit has provided for consistently high throughput. A small increase in end point of the feed means a significant reduction in feed rate.

End point of stabilized heavy naphtha must be kept below a critical limiting value if this stock is to be blended into gasoline. Installation of end-point monitors marked the production of an improved blending stock.

Automatic measurement of pour point of light catalytic cycle oil has proved worthwhile because this stream is ultimately blended into distillate fuels which have limiting specifications on pour point.

Pure aromatics are produced from reformate by extraction and distillation. Traces of impurities in product streams can be detected with simple automatic distillation instruments. In the purity range of 99.5 to 100%, purity can be estimated to within 0.02%.

Finishing and shipping. An automatic instrument which measures mercaptan number keeps reagent

usage and contact time at a minimum in sweetening.

Most economical blending in gasoline production is determined by computer calculation, but process monitors can aid in reducing product variation to narrow limits. These instruments measure front-end volatility. Reid-vapor-pressure monitors give an indicate of butane content, and a distillation monitor measures the per cent distilling up to 158° F. as an indication of pentanes.

These instruments reduce blending time and improve precision of in-tank-blending operations. And they provide good checks on the blending system in inline operations.

Blending of distillate fuels to make heating oil involves problems of meeting specifications on pour point. Installation of an automatic pour-point monitor has significantly reduced the volume of product with a pour point lower than the specification requires.

Chromatography

Possibly the most versatile stream analyzer yet to be developed is the automatic chromatograph. It has found wide application wherever light hydrocarbons must be analyzed. Typical of many installations is that of Gulf Oil Corp., at its Philadelphia refinery, where alkylation efficiency has been increased by a continuous chromatograph.[6]

Before installation of the automatic instrument, laboratory-analysis time was too great for proper control of the unit. A process chromatograph was installed to analyze each of five important streams:

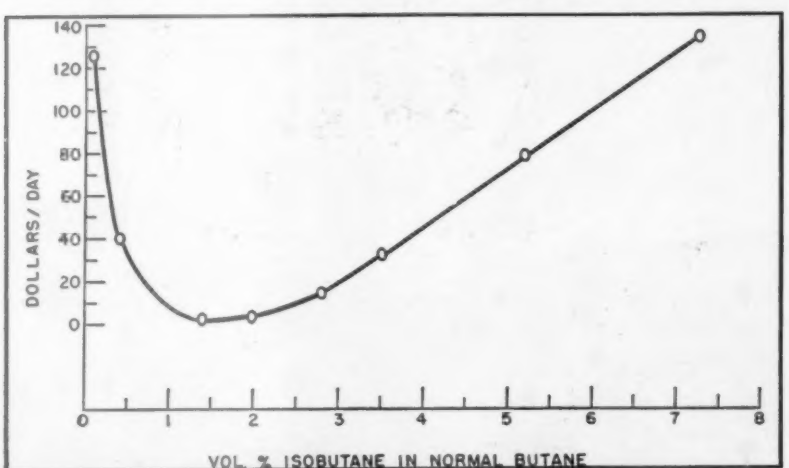
1. Deisobutanizer overhead (isobutane), to maintain normal butane concentration as low as economically possible.
2. Debutanizer overhead (spent butane), to maintain isobutane concentration as low as economically possible.
3. Butane-butene feed, to keep propane concentration low by adjusting gas-recovery system at the fluid catalytic cracking unit.
4. Butane feed, to keep propane concentration low.
5. Depropanizer feed, to indicate actual propane content in the refrigeration system.

Payout on the installation was approximately 4 months, based on savings in acid, better isobutane use, reduced TEL requirements, and reduced laboratory expense. A plot of the first three of these costs is shown in Fig. 7. This shows that the volume per cent isobutane in the spent butane should be maintained at 1.4%. This can now be controlled closely, with the real-time analyses from the chromatograph.

New valve. Recently a new valve was developed which makes liquid sampling feasible and practical for the chromatograph[7]. The preheated liquid sample is delivered from the valve into a preheated carrier system, and then into the analyzer column.

In one application, the liquid-sampling was set up to record isobutane, normal butane, isopentane, and normal pentane in a reformer stabilizer bottoms, a material with a 228° C. end point. Total analysis time is 15 minutes; that for C_4-C_5 analysis is 4.5 minutes. Sample size is 0.01 ml. of liquid. Full-scale sensitivity for C_4's is 1%, and that for C_5's is 5%. Excellent baseline stability is attained.

The chromatographic technique has been adapted to simulate true-boiling-point distillations, using programed heating on the column, and with silicone rubber on fire clay as packing material. And the method has been extended to some other packings at higher temperatures. This has been used in the laboratory rather extensively, and the technique is now being looked at on process-stream analyzer basis.



CHROMATOGRAPH PAYOUT on Gulf's alkylation unit was about 4 months. Acid savings, better isobutane use, and reduced TEL requirements, plotted here, accounted for most of the cost reduction. Fig. 7.

Moisture monitoring. The automatic electrolytic moisture analyzer is now the preferred method for the determination of trace water in gaseous and liquid process streams.[8] Most moisture determination problems can be solved satisfactorily by an instrument of this type.

Instruments have been used on ethylene containing less than 10 p.p.m. moisture for approximately 2 years, with negligible maintenance. Similar results have been obtained on a stream containing a mixture of hydrocarbon gases. In each of these cases, moisture breakthrough on gas driers is determined.

Other instruments are also capable of determining trace amount of water in various fluids. One of the most promising is near-infrared instrument designed primarily for determination of moisture in liquids. It is designed for full-scale ranges of 0 to 100 p.p.m. or less.

The conventional infrared analyzer, the differential adsorption instrument, and the chromatograph have also been used successfully for moisture determination. However, these instruments are much more complex and expensive than the electrolytic or near-infrared analyzers.

Other analyzers. Other automatic process-stream analyzers which may be applied in refining are:

Specific gravity, gravimetric, differential-bubbler, or radioactive type. Good results can be obtained.

Infrared, usually installed to detect one component, but dual installations can be used to detect two components.

Ultraviolet, usually to analyze for one component.

Refractometer, which is normally

applied to clear, transparent binary liquids.

Sulfur, an extremely sensitive electrolytic titration device for use in monitoring gas streams.

ASTM distillation, which determines five points on the curve. From these points, the curve can be constructed. This instrument is under development by American Oil Co., which now hopes to extend and improve the instrument. It should be good up to the point where vacuum distillation is needed.

Mercaptan, which provides significant cost reduction in gasoline-sweetening operations. Cycle time is 3 minutes.

Bromine index, which can automatically determine correct olefin analysis using a 6 to 8-minute cycle.

Pour point, which gives accurate readings, good to 1° F., on a 15-minute cycle.

Dielectric constant, which American Oil Co. is using as an indication of octane number of reactor effluent from Ultraforming unit at Whiting.

Other stream analyzers are also available. And it's safe to say that development work is going on wherever analytical problems involving time and accuracy are encountered. For example, analyzers are needed to define gas oils and cycle oils. Perhaps a type analysis may be the answer, but whatever the final answer, work is being done in this direction.

Maintenance

Specially trained instrument men must be used to maintain any process-monitoring instrument if efficient instrument performance is expected.[5] Usually, maintenance has been poor in those refineries reporting unsatisfactory results from commercial instruments.

In American Oil's Whiting refinery, where there are approximately 50 stream monitors installed, two specially trained instrument men work on them almost exclusively. At other American refineries where there are fewer instruments, a technical man has been assigned to the instrument department to assist the instrument man. These technical men have had special training on stream analyzers.

The maintenance requirement for any instrument depends on the stream being tested. In general, it has averaged 1 to 2 hours per week per instrument. After extended periods of operation, some preventive maintenance involving a general overhaul and recalibration is desired.

Maintenance time can be reduced where there are several identical instruments, if piping is arranged so that all instruments can be connected to the same stream. This situation prevails on a gasoline-blending system where three instruments measure vapor pressures of samples from three streams.

Chromatograph maintenance. Instrument men must receive thorough training on the specific stream analyzers installed in the plant. Approximately 2 weeks of intensive training are required to qualify an instrument man for chromatograph maintenance at Gulf's Philadelphia refinery.[6] An over-all average of 6 man-hours per week has been found necessary to keep a unit in calibration and perform preventive maintenance.

Determining Analyzer Usefulness

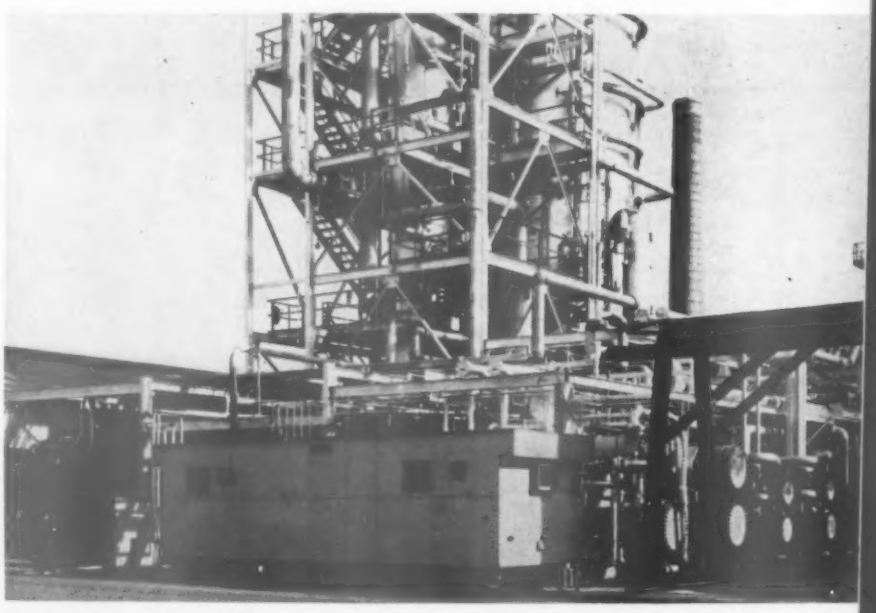
Standard Oil Co. of Ohio has established a project to evaluate process analyzers and determine their best application[9]. A group of trained people, with a wide variety of talents, make field tests using a mobile trailer which is moved to a selected area in one of Sohio's refineries. The trailer is shown in Fig. 8.

The trailer was constructed to Sohio's specification. In addition to its primary job as a home for process analyzers to be tested, the trailer serves as a mobile control laboratory, a convenient field office for testing personnel, and an on-the-job classroom for training the plant operating and maintenance personnel who will be responsible for the analyzers once they are installed permanently on the units.

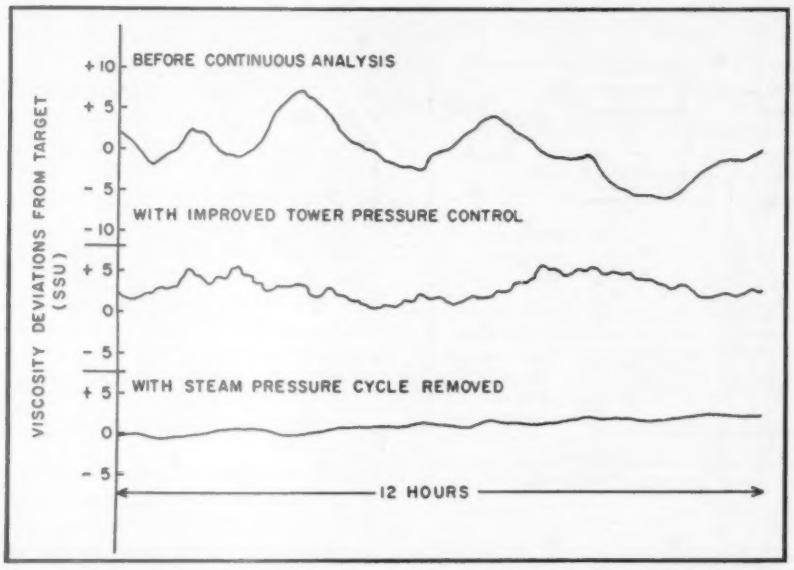
Two considerations govern the selection of a plant site for testing analyzer equipment and techniques:

1. A definite, recognized unit operating problem or question exists. The equipment to be tested is therefore put to use almost immediately in solving problems and answering operating questions. Thus, the testing effort soon begins to return some of its expenditure. And the cooperation of unit operating personnel is assured, once some of their problems have been solved.

2. A number of suitable test streams are readily available. For example, in the testing of distillation analyzers, a crude unit was selected, since all the refinery streams on which these devices could possibly be used were found on this one unit.



SOHIO ANALYZER TRAILER is moved from unit to unit in the refinery, to evaluate process analyzers and determine their best application. Fig. 8.



PRODUCTS VISCOSITY VARIATIONS were reduced markedly during a Sohio evaluation of process viscosity analyzers on stream produced at a vacuum unit. Fig. 9.

The program has had a marked evolutionary trend since its inception several years ago. The initial test program was 100% hardware evaluation. Since that time each succeeding field test has included a greater proportion of application evaluation.

One test was devoted to chromatographic control of a light-ends fractionator designed to separate isobutane and normal butane. Studies showed that tower pressure is the most significant operating variable, and that vapor composition on the forty-fifth tray was the most desirable sample for control purposes.

Result of this test is a control installation with a chromatograph continually analyzing a sample of vapor from the forty-fifth tray. Chromatographic output is used to stroke directly the overhead product draw-off valve. This directly varies the tower pressure by adjusting the liquid level in the flooded-type overhead condenser.

Fig. 9 shows the results of another process evaluation. Several process viscosity analyzers were used to monitor the streams produced at a vacuum unit. Improved pressure controls, developed from continuous viscosity analyzers, reduced products viscosity variations markedly.

Phillips work. Phillips Petroleum Co. also has a mobile trailer which is used to make field tests of stream analyzer applications, and actually to carry out process analyses to an even greater extent than Sohio.

The Phillips trailer, now on location at its Borger, Tex., refinery, contains several stream analyzers, including special fast-analyzing on-stream chromatograph. It also contains an Autonetics Recomp 2 digital computer which is used as a data-reduction device and an over-all check for system errors, such as wrong meter readings. Properly prepared data are than transferred to the Phillips IBM 7090 in Bartlesville, Okla., for detailed analysis.

The Phillips instruments are now in phase one of a two-phase program of analysis of the new Borger cat cracker. Phase two is the building of a mathematical model for the cracker. Here, too, the Recomp 2 will be used as a primary calculator and data-reduction device. Detailed analysis will be made on the 7090.

The Phillips steering committee for the cat cracker instrumentation and control setup is composed of three men—one from the refining department, one from the computing department, and one from research and development. A working committee functions under the supervision of this group.

Other logging trailers. Dresser/SIE has furnished one logging trailer to a chemical company and two to refineries. As shown in an accompanying photograph, these trailers are equipped with input controls, patch panel, conversion equipment, and recorder. They are designed for use of the CM-3 analog computer, but can be adapted for other computers if desired.

ANALOG CONTROL COMPUTERS PROMISING

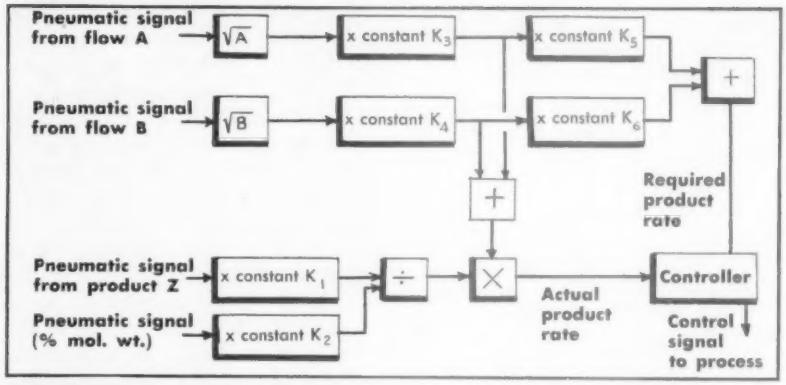
WHILE THERE HAS not been as much interest shown lately in application of analog-control computers as there has been in digital-control machines, there is general agreement that these devices will come into their own in solving control problems dealing with small units or portions of the larger refining units.

The more sophisticated analog computers have not played a greater role in process control because a thorough process analysis must be made if a good control system is to evolve.[10] Manufacturers of the analog units have not been willing to foot the bill for such analyses because they cost much more than the equipment itself. And the manufacturers have not been able to see the future payout envisioned by the digital suppliers.

Analog manufacturers are now tackling these and other problems, such as inability of the analog to be time shared, and its limitations of system accuracy. It is predicted that the analog will take its place with digital in handling control problems, generally in systems costing less than $50,000.[10]

Applications withheld. Still another reason for lack of publicity on analog-computer-control systems is that users have asked that application details be withheld. For example, seven CM-2 series Dresser/SIE computers are now in use, and results from all seven are considered "company confidential."

An unofficial spokesman for one major refinery said that computer control with one of the units had definitely paid out, but final results were not as good as expected, due to other process limitations not previously considered. Results on other installations previously announced[11] are not available as yet.



NEW PNEUMATIC ANALOG COMPUTER, developed by AiResearch Phoenix contains five computer modules, performs 12 mathematical functions. Unit sells for about $2,500. Fig. 10.

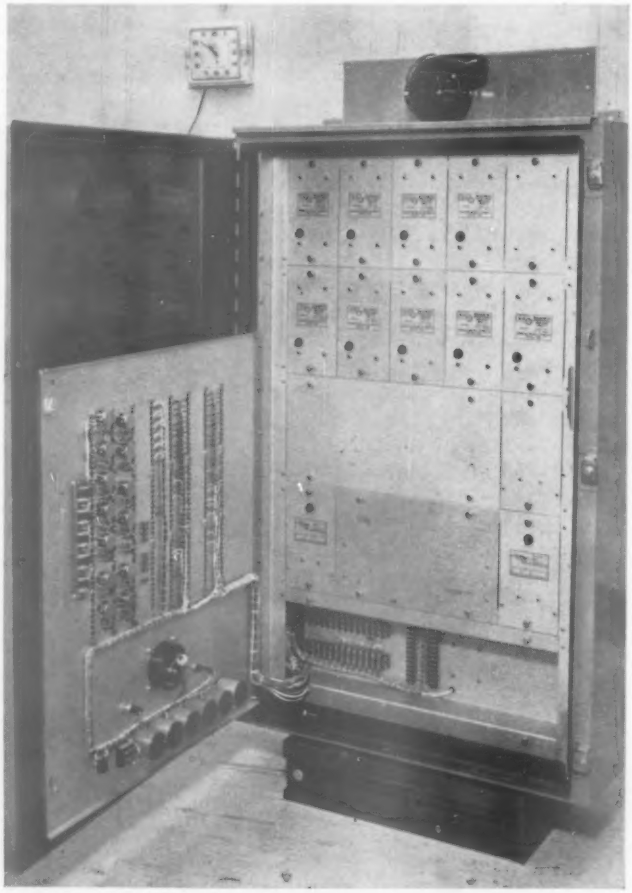
Specialty computers. There has been a trend in the petroleum industry to develop special analog-computer-control units to handle special problems. Typical of this development is the Phillips analog computer for internal reflux control,[12] which has been licensed to several companies for sale.

It can be shown that internal reflux in a fractionating column is a function of external reflux and the temperature difference between the overhead vapor and the external reflux:

$$R_i = R\ (1 + K\ \Delta T)$$

The computer includes an EMF-to pneumatic converter, to change difference in thermocouple voltages to pneumatic output proportional to $1 + K\ \Delta T$; a Sorteberg square-root extractor, to extract square root of differential - pressure measurement on external reflux flow (proportional to R^2), to produce an output proportional to R; and Sorteberg multi-

DRESSER/SIE LOGGING TRAILER is equipped with input controls, patch panel, conversion equipment, and recorder.



ANALOG COMPUTER directly accepts pressures, temperatures, flows, and other variables, and computes equation descriptive of process for optimum control. Photo courtesy of Dresser/Sie.

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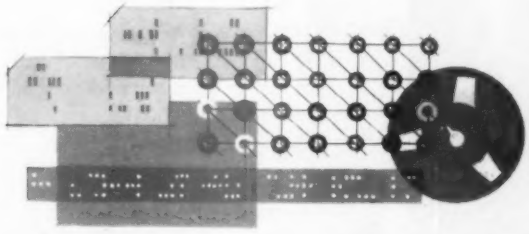

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plier, with an output proportional to R (1 + K ΔT).

Other specialty computers use similar principles and components to optimize horsepower, electrical consumption, etc.

New computer. Any good instrument engineer can design an analog control computer with several components, and actually build the unit from off-the-shelf items. However, the more complicated the final computer, the longer it will take to evaluate constants and work out the kinks.

AiResearch Phoenix Division of Garrett Corp. recently announced a pneumatic-analog control computer containing five computer modules, which will perform 12 mathematical functions. The unit sells for about $2,500.

Fig. 10 shows how this system would work on a flow-control problem. It can of course be adapted to control other processes of equally complex nature.

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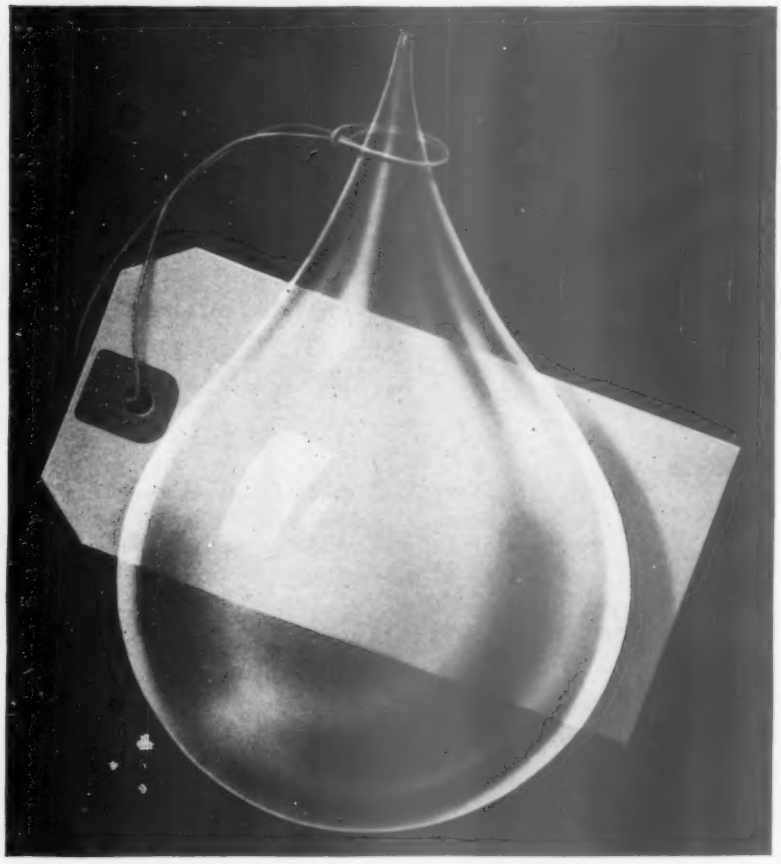

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Quiz on distillation

In concluding the section on distillation principles, here is a series of questions to serve as a review for the first six parts of the section.

Please place a check mark opposite the correct answer (√).

	Norm. b.p. – °F.
1. Pentane (C_5)	97
Hexane (C_6)	156
Octane (C_8)	258

Separation of the components will be the easiest from which of the mixtures listed below:

(a) 50% C_5, 50% C_6.
(b) 50% C_6, 50% C_8.
(c) 50% C_5, 50% C_8.

2. The vapor pressure of isopentane at 130° F. is 29.4 psia. What is its normal boiling point?

(a) 163° F.
(b) 130° F.
(c) 82° F.

3. A liquid mixture, 10% butane, 90% pentane, is in a closed vessel at 50° F. What is the total vapor pressure of the liquid mixture?

(a) About 25 psia.
(b) About 12.5 psia.
(c) About 6.5 psia.

Vapor pressure at 50° F. = 20 psia.

Vapor pentane at 50° F. = 5 psia.

4. A mixture of **equal** amounts of C_6 and C_8 are boiling at the bottom of a tower. The vapor above the liquid will contain

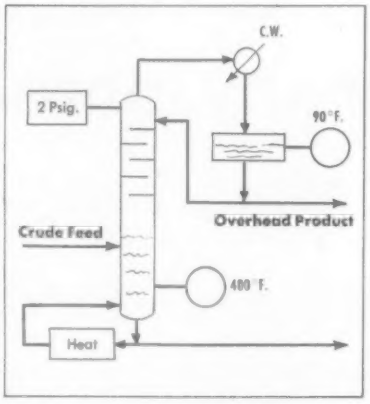
(a) More C_6 than C_8.
(b) Only C_6.
(c) Equal amounts of C_6 and C_8.

5. Crude oil is charged to a batch still and distillation started at constant pressure. After half the liquid is distilled off, the still temperature will be

(a) One-half the initial temperature.
(b) Higher than the initial temperature.
(c) Same as initial temperature.

6. The normal boiling point of hexane is 156° F., and for heptane 209° F. If a 50-50 mixture of these were charged to a batch still, what temperature would we have to reach in the still to vaporize overhead **all** (100%) of the hexane?

(a) 156° F.
(b) 177° F.
(c) 209° F.



7. We are feeding continuously 100 barrels per hour of crude oil to the still above and are obtaining 20 barrels per hour of overhead product having a volume average boiling point of 200° F. (meeting specification). What can be done to increase the production of overhead product meeting the boiling point specification?

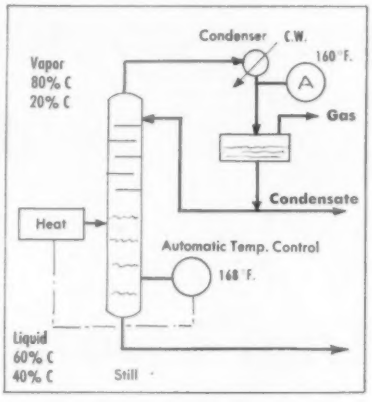
(a) Increase still temperature.
(b) Decrease pressure on still.
(c) Increase feed rate.

8. What is the main reason people use "permanent" instead of alcohol antifreeze in their cars?

(a) It has lower boiling point.
(b) It has lower vapor pressure.
(c) It has higher vapor pressure.

9. Why is more butane included in our gasoline in the winter than in the summer months?

(a) So that the gasoline will begin to vaporize at a lower temperature.
(b) To prevent gasoline from vaporizing in car's gas tank.
(c) To lower freezing point of gasoline.



10. In the above operation, all of the vapor coming from the still is being condensed. **If the S.W. rate to the condenser were cut back and the temperature at A rose to 164° F., what would be the composite of the condensate?** (Any temperature above 160° F. at A will not give complete condensation.)

(a) 80% C_6, 20% C_7.
(b) 70% C_6, 30% C_7.
(c) 85% C_6, 15% C_7.

Quiz Answers

DISTILLATION I

1. (c) 50% C_5, 50% C_8
2. (c) 82° F.
3. (c) About 6.5 psia.
4. (a) more C_6 than C_8
5. (b) Higher than the initial temperature.
6. (c) 209° F.
7. (c) Increase feed rate.
8. (b) It has lower vapor pressure.
9. (a) So that the gasoline will begin to vaporize at a lower temperature.
10. (b) 70% C_6, 30% C_7

This material taken from process-training-program manual, Bayway, N. J., refinery of Humble Oil & Refining Co.

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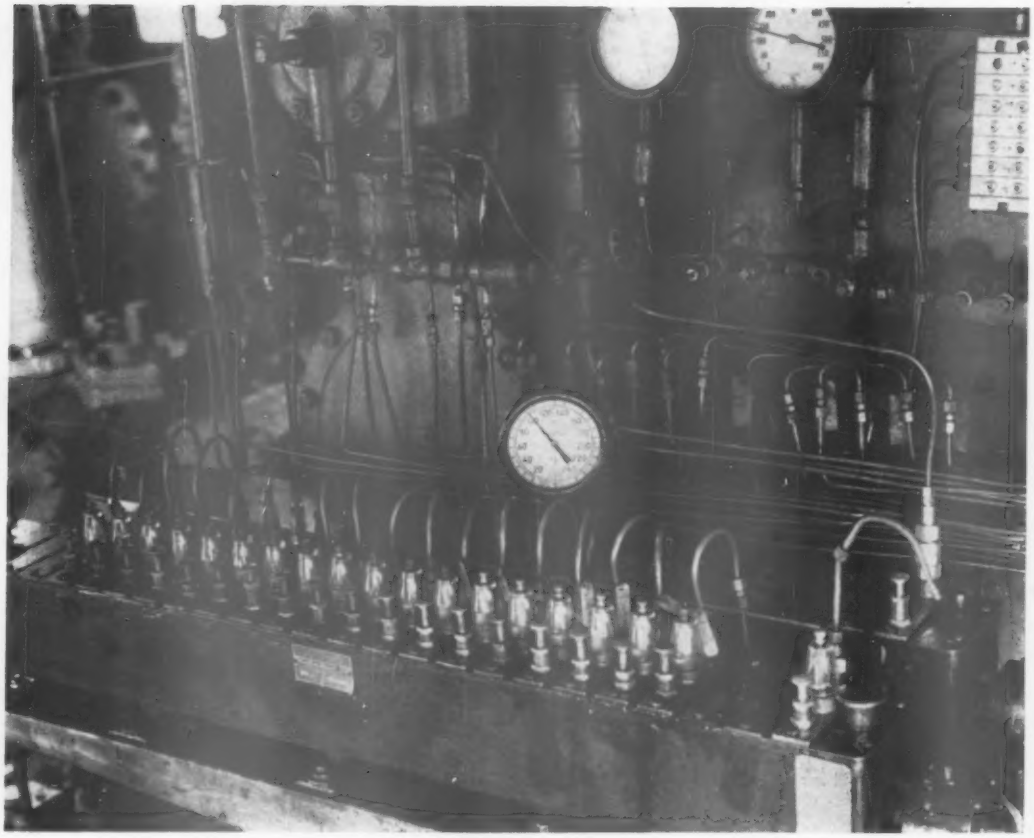


VIEW of the compressor's governor end shows the initial installation of a single jumbo lubricator on the steam cylinder lubricator box (rear). It replaced the 24-point steam engine lubricators by metering specific quantities through the Trabon distributors (upper right). The picture was taken after the change on the steam cylinder lubrication system, but prior to the gas-cylinder lubrication change.

Central lube system for compressors saves

A CENTRAL lubrication system on 10 compressors saved Neches Butane Products Co. $210,000 in labor and material costs alone in 5 years of operation.

Further, down time has been cut.

The system provides a precision supply of lubricant for steam-engine driver and gas-compressor cylinders.

Background

Neches Butane Products Co., at Port Neches, Tex., is a 300,000-short-ton-yearly butadiene monomer plant which is owned jointly by Goodrich-Gulf Chemicals, Inc., and Texas-U .S. Chemical Co.

The plant is divided into two major units. Each unit has five steam-engine-driven reciprocating two-stage gas compressors which compress hydrocarbon gases from the dehydration units for delivery to a gas-recovery section.

Excessive maintenance costs were sustained shortly after initial compressor operation. Also steam power and valve cylinders wore excessively.

Many tests, settings, and adjustments were tried to minimize costs but failed to solve the difficulties. Similar lubrication studies were being made in other industries at the same time.[1]

Excessive wear continued to be a problem even though various types of rings, lubricants, and sleeve liners were tried. The rising cost of down time complicated the problem.

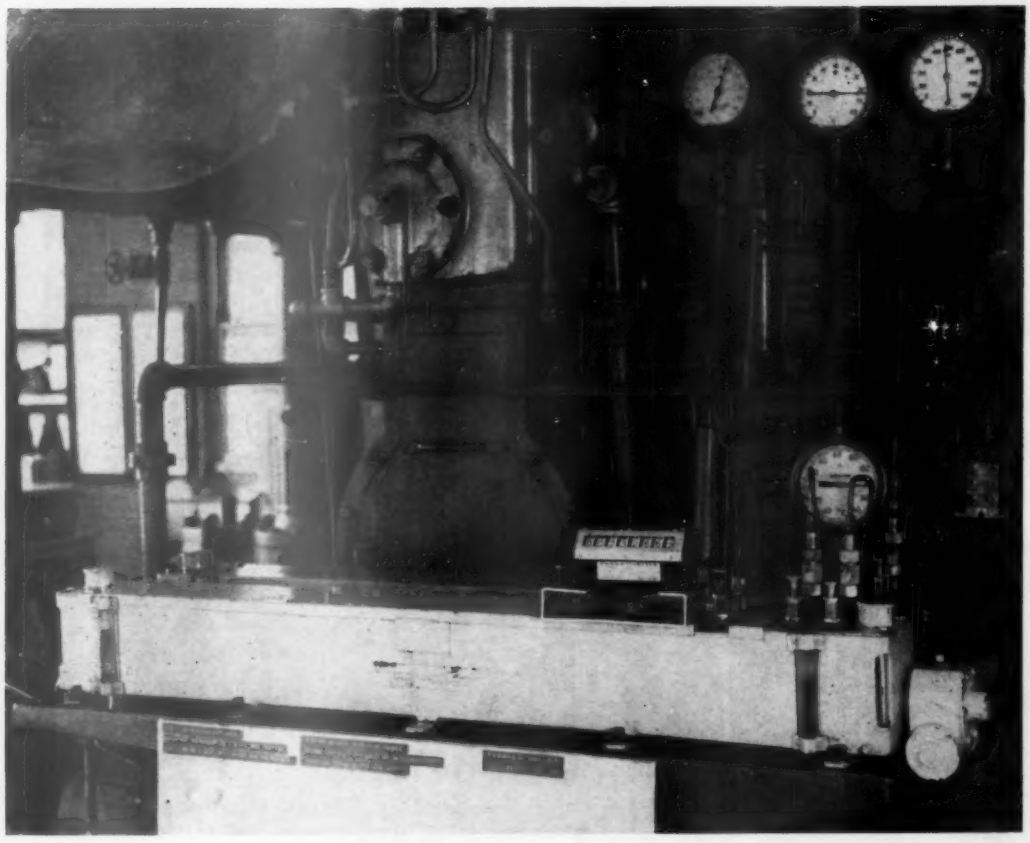
Ring fillings which damaged packing and power rods were found frequently worked into the packing when the engines were down for repairs or inspection. Erratic lubricant supply to atomizers in the steam-supply line was evident because some exhaust-steam traps were heavily coated with oil while others were dry.

Individual pumps were used originally—24 on each steam engine and 18 on each compressor which made a total of 420 individual lubricators on 10 compressors.

The need became obvious for accurate calibration and control.[1] Extreme variations in lubrication were resulting from the impossibility of maintaining close adjustment on a large number of individual lubricating units. Maintenance personnel were kept busy cleaning and repairing lubricators.

The steam-engine manufacturer recommended 6 qt. to steam-line atomizers, 4 qt. to power cylinders, 1 qt. to valve-rod packing, and 1 qt. to power-rod packing for a total of 12 qt.daily per compressor.

However, tests showed a 24-pump lubricator battery output varied from 5 to 20 qt. per running day of oil. Some steam-engine parts obviously were not being supplied adequately while others were over-lubricated.



COMPLETED installation of distributors for both steam-cylinder and gas-cylinder lubricating systems.

$42,000 a year in processing costs

BY H. A. ANDERSON
General Maintenance Foreman
Neches Butane Products Co.

Numerous tests and adjustments over a period of months attempted to obtain the correct oil quantities. However, proper lubricator adjustment proved impossible.

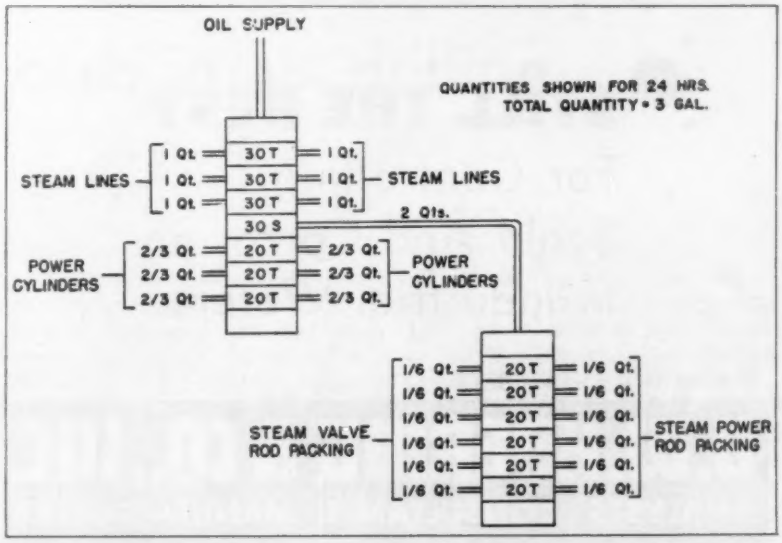
Central Lubrication System

Engineers from Hydraquip Corp. subsequently were consulted about possible use of Trabon lubrication systems. A precise oil-distribution plan was worked out although the systems had not been adapted previously for this kind of application. Pump modifications can be made, also.[2]

First, alternate lubrication points were changed as a temporary measure. "Feeders" were tested to make sure that exact distribution would prevent cylinder damage and avoid excess oil usage.

Several individual lubricators first were harnessed into a manifold to check lubricant distribution.

Later, a single "jumbo" lubrica-



SCHEMATIC LAYOUT of Trabon distributor for steam cylinders, valves, and rod packing. The numbers refer to the amount of oil each section delivers per stroke. "T" is a twin outlet, and "S" is a single outlet.

tor with distributor blocks was connected to the 24 steam side points on one engine. Adequate lubricant delivery to every point was evident within a very short time. Plunger failures had been eliminated. Ring and cylinder wear was reduced to negligible proportions.

Shutdown time due to wear or lubricator failure was practically eliminated during the 18-month test period.

Indications, based on the tests, were that elimination of 400 lubricators would effect a saving over $5,000 per year in lubricator maintenance labor alone. Trabon equipment was installed on all 10 engines as a result.

It was decided to install distributors for the 18 points on each compressor as well, although no serious difficulty had been encountered with the compressors.

The ultimate result was that 20 lubricators, feeding through manifolds, were doing the work that 420 individual pumps previously had been unable to handle on the 10 compressors.

Lubricators were connected to pressure gages in the central control house of each unit as a safety measure which enabled a single operator to keep a check on all points.

Three separate and distinct distribution circuits have been set up. Each is doing a precision job affecting savings in maintenance manhours and replacement parts.

Savings

Precision supply of lubricant was reflected in oil consumption. A typical daily tabulation for five engine-compressors in one unit shows only a small variation among compressors, Table 1.

Table 1—Typical Daily Oil Consumption

Compressor	Steam cylinder oil Qt./SD	Light oil Qt./SD
1	11.6	5.9
2	11.6	5.9
3	12.3	5.6
4	11.0	5.7
5	9.9	5.0

Over 5 years of performance confirmed earlier savings estimates from central lubrication control. Labor savings alone on lubricator maintenance, as anticipated, have totaled $35,000 in a 5-year period.

In addition, actual material costs for steam cylinder liners in the 5-year period before Trabon installation was about $1,000 per year per compressor for a total of $10,000 per year for the 10 compressors.

It conservatively is estimated that erratic lubrication on each compressor required $1,500 yearly for additional labor and $1,000 yearly for replacement parts. Table 2 shows the 5-year savings on materials and labor since installation of the central lubrication system.

Table 2—Five-Year Savings

Labor—lubricator maintenance	$35,000
Materials—steam cylinder liners	50,000
Labor—compressor maintenance	75,000
Materials—compressor maintenance	50,000
Savings	$210,000

In addition, the high cost of equipment-offstream time has been eliminated which considerably increased total savings.

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1. Moore, O. H., "Why Engine Lubrication Fails": The Oil and Gas Journal, Vol. 58, No. 49, p. 132, (Dec. 5, 1960).
2. Moore, O. H., "Adjust Stroke to Even Oil Flow for Proper Engine Lubrication": The Oil and Gas Journal, Vol. 58, No. 51, p. 109, (Dec. 19, 1960).

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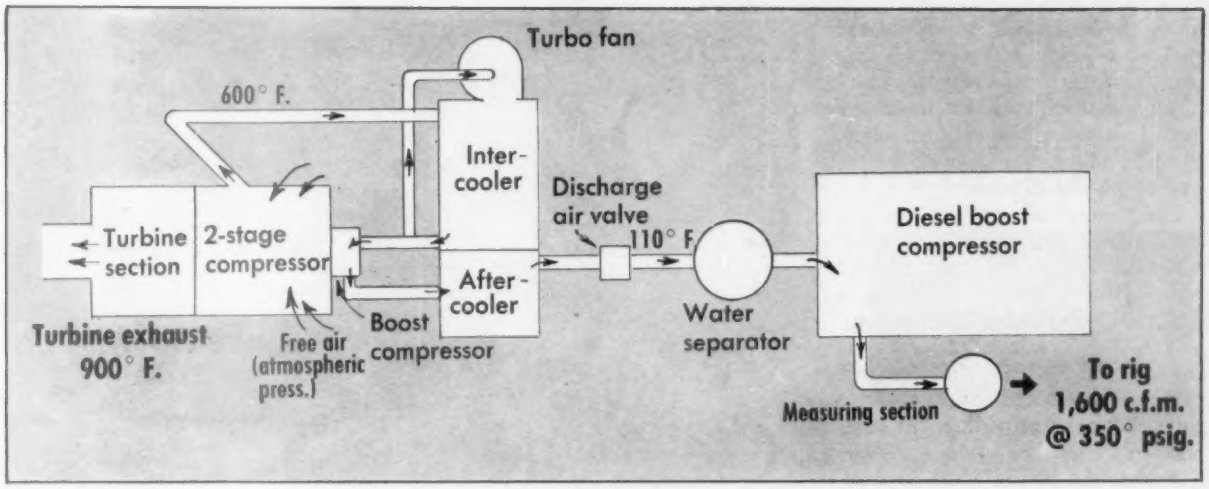

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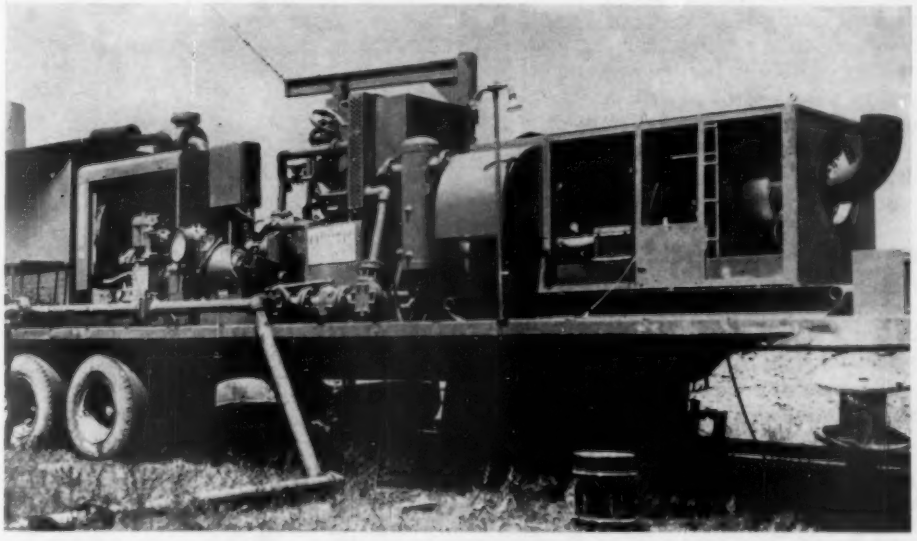


provide good penetration rates as . . .

Gas turbine scores in air drilling

BY PETER B. BIKE
Journal Staff

FIRST commercial operation of a prototype gas turbine to deliver compressed air for air drilling has been deemed a success.

The turbine delivered up to 1,645 c.f.m. of air at pressures up to 165 psi. in drilling a well almost from surface to total depth of 6,603 ft. This volume of air resulted in excellent penetration rates, good hole cleaning, and superior cuttings recovery. Everyone concerned agreed that performance was as good or better than that which could be expected with the combined output of four commonly used piston-engine-driven compressors.

The jet-type equipment operated without interruption for the first 6,000 ft. of hole. Standby equipment was used only briefly in the remaining short interval to total depth.

Setting for the test was the Arkoma basin; the well was Humble Oil & Refining Co.'s 1 E. D. Burris in Leflore County, Oklahoma. The turbine is a model GTCP 105-1 manufactured by AiResearch Division of Garrett Corp.; this model turbine is capable of delivering 1,600 cu. ft. of air at pressures up to 350 psi. Mission Manufacturing Co. assembles and mounts the components of the package for field use.

Mission officials say that the company expects to have the turbine unit available for rental in a number of areas soon. Price and output of each unit will be competitive with the commonly used combination of four piston-engine-

driven compressors. Moreover, trucking expense will be much less with the single float-carried gas turbine. Since the turbine takes up less space than conventional compressors, there may also be a saving in location expense.

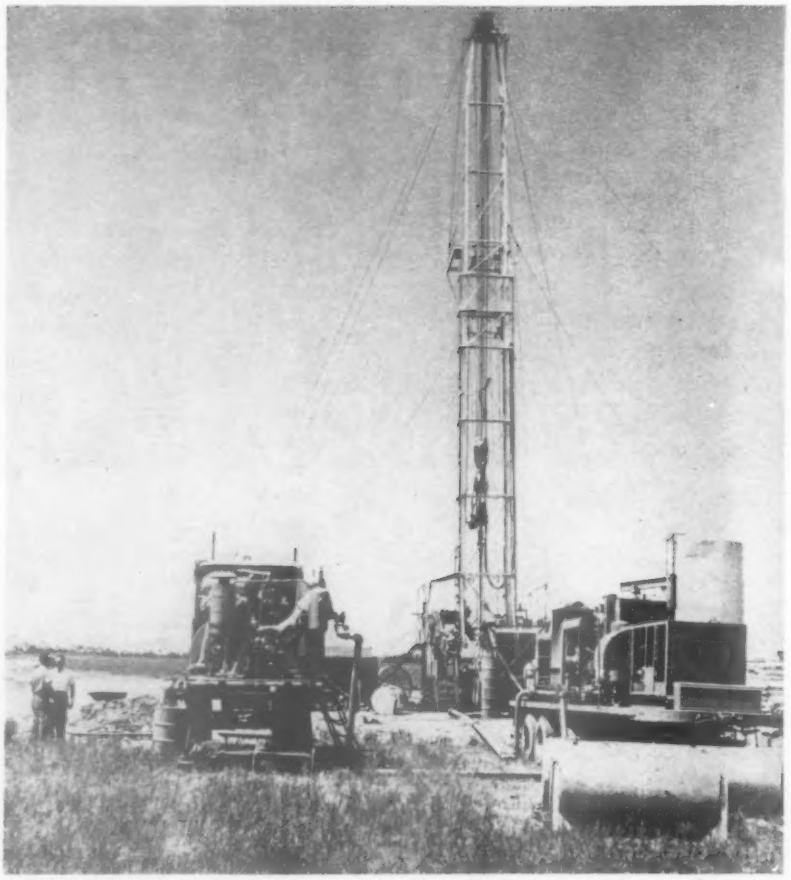
Long heralded as the coming entry in packaged equipment for oil-industry work, the gas turbine proved itself capable of doing a good fast job, and a worthy competitor of conventional reciprocating engines. Here's why the mighty mite of the aircraft industry has a good chance of providing stiff competition:

During the period when air drilling commenced at 420 ft. to a depth of 4,011 ft. when the rig was visited, the Mission "round power package" drilled 3,591 ft. in 77.1 hours of actual rotating time for an average of 46.6 ft. per hour. Better yet, at a later stage of drilling, the unit made almost a foot per minute.

The operator had predicted a drilling time of 13 days to 6,000 ft., based on air drilling in other nearby wells. The gas-turbine-compressed air drilled the hole to that depth in less than 8 days.

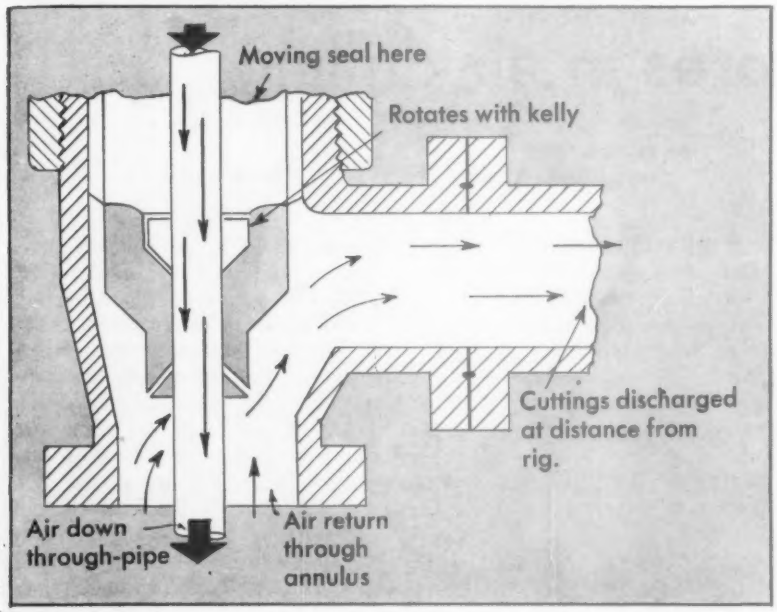
Moreover, the client, Humble, received a new stepout gas well completed for 1 M.M.c.f.d. of gas.

No separate compressor. The turbine does not drive a separate com-



COMPRESSED-AIR SUPPLY UNIT is located adjacent to rig, though slightly removed. Turbine compressor trailer on right is in-use unit; while conventional diesel compressor trailer is emergency standby air source. Second unit was not needed in this well.

CUTAWAY SKETCH of rotating blowout preventer shows the air-flow pattern. Air from compressor goes down through drill pipe and returns with cuttings up the annulus to the discharge line. Design is by Shaffer Tool Works, Brea, Calif.



COMBINATION rotating blowout preventer and stripper is mounted on Shaffer hydraulic control gate. Note discharge line on right.

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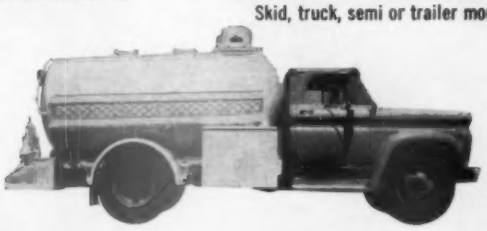

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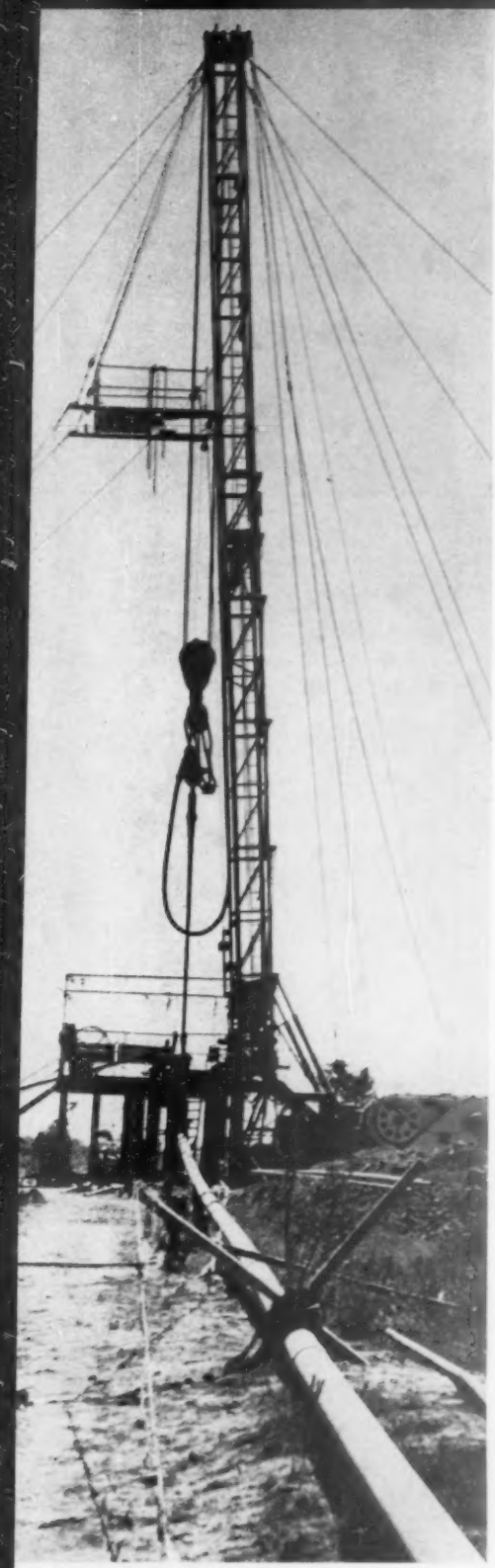


LOOKING UP the "blooie (discharge) line" to the rig it is noted that the disposal area for the cuttings is 300 ft. or more from the well.

SWOOSHING DUST empties cuttings into the disposal pit. Dust is no problem when prevailing winds carry dust away from rig. In case of a gas show, dust can be ignited to test volume of gas encountered.

pressor. Instead, it puts out a portion of the compressed air which would normally be burned in powering the turbine itself. Here's what the power package consists of: First comes the turbine section which has a two-stage compressor and includes intercooler, a boost compressor, and an aftercooler. The next component is a water separator followed by a diesel-engine-driven piston compressor. Then, a measuring section is last.

Taking the components separately, the turbine is essentially a prime mover of the type used in jet aircraft. However, in this case, no shaft power is developed. Free air at atmospheric pressure is taken into a circular intake. The turbine then compresses the air in two stages, although part is burned and exhausted at 900° F. That part which is compressed leaves the first section of the turbine at 600° F. It then moves to the intercooler.

Part of the air leaving the intercooler is recycled to a turbofan, thereby increasing intercooler efficiency; the main air supply continues to the aft turbine section to the booster compressor. Leaving the boost compressor, the air goes to the aftercooler. Prior to reaching the water separator, the compressed air temperature is about 110° F.

From the separator, the air goes through a separate diesel-engine-driven boost compressor, hence to a measuring section. From here it goes to the rig standpipe.

The final boost compressor is powered by an Allis - Chalmers 16000 diesel engine. This engine is six-cylinder, 5½ by 6½ with 844 cu. in. displacement. Maximum

FIELD ENGINEERS surveying the equipment are William R. Andrews, engineer, AiResearch, Phoenix; Vance Stone, tool pusher, Chris Well Service, Oklahoma City; J. W. O'Neal, district engineer, Mission, Fort Smith; Don McKeehan, engineer, Mission, Houston; and on trailer, LeRoy Thurman, engineer, Mission, Houston.

horsepower developed is 230 at 2,000 r.p.m.

In the Leflore County test, the drilling contractor was Chris Well Servicing Co., of Oklahoma City.

Future of gas turbine. Many engineers feel there should be a wide number of possible uses for gas-turbine engines in the petroleum industry. Not only can turbines be used as a power source, but they can also provide compressed air or a combination of shaft horsepower **and** compressed air.

Principal advantage of the gas turbine over the reciprocating engine is the high horsepower developed from low unit weights. For instance, the entire GTCP 105-1 gas-turbine package weighs only 4,000 lb.; yet, it can deliver as much compressed air as 38,000 lb. of diesel-engine compressors.

A wide variety of fuels—from natural gas to heating oil—can be used in the turbine. In the Oklahoma test, kerosine was used.

Other claims for the gas turbine are longer life, less friction wear, fewer moving parts, high pressure and volume capacities, and quick starting in all weather extremes.

The turbine, of course, does have disadvantages: It makes a lot of noise and it costs a lot of money.

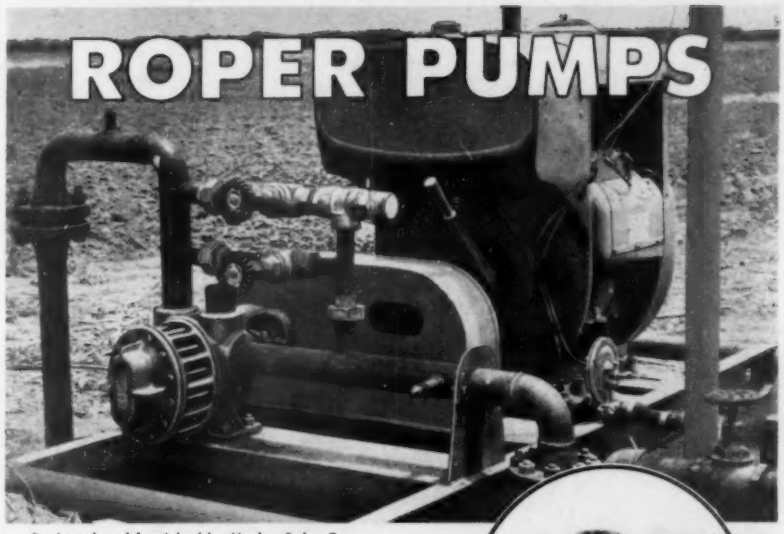
It may be a while before gas-turbine units used in air drilling may be sent to the field without specially trained field engineers. On this operation in Southeast Oklahoma, Mission kept two field engineers on rotating shifts and AiResearch had an enginer on location.

Hard-rock area. The gas turbine test was in an area famed for its hard rocks. It is only in recent years that improved drilling technology—including air and gas drilling—has made it profitable to wildcat in this region. The Humble well was 2 miles north of the Cartersville gas area and had been projected as a 6,000-ft. test of the Cromwell formation. It was completed from the Spiro sand member, Des Moines-Savana formation at 6,208 ft.

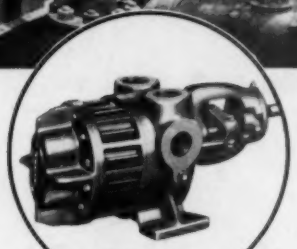
The 13⅜-in. surface pipe was set at 420 ft. in a hole drilled with mud. Below the 13⅜-in. all drilling was with straight air.

It is reported that the formation samples were of better quality than other air-drilled holes in the area.

ROPER PUMPS



Designed and furnished by Harley Sales Co. Tulsa, Wichita, Houston



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Crude oil stored in field tanks is moved to pipeline gathering system by this packed box model Roper 1F50 unit. The pump operates at average speed of 850 rpm, moving the 75 SSU viscosity oil at a rate of up to 50 barrels per hour at 300 psi. The gathering unit has automatic timer control, so that it needs no supervision during operation and shuts off at a predetermined time. This particular installation is in use two or three times a week and runs unattended 10 to 12 hours a day. The Wisconsin VH4D power unit, short-belted to the Fig. 1F50 pump, is equipped with natural gas hook-up for economical operation. The structural steel mounting skid is standard for installation of this type. The Series F has numerous applications as general transfer unit in oil fields.

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SHELL'S NEW JET REFUELER at New Orleans can complete a 7,000-gal. refueling job in 15 minutes. Bottom loading eliminates static electric charges that sometimes build up in conventional overhead loading.

New Shell facilities aid refueling

FUEL PURITY and fast refueling, two of today's most pressing needs by aircraft, are provided at Shell Oil Co.'s new refueling facilities at Moisant International Airport, New Orleans.

The new facilities have the most modern storage tanks, loading docks, and refueler trucks for servicing piston, turboprop, and jet aircraft.

Fuel purity and fast refueling are so important because of close clearances in the fuel system and the short time available to refuel large jet aircraft. For example, one of Shell's contracts at New Orleans is to fuel Eastern Air Lines' DC-8 jets which fly between New York and New Orleans. The fuel systems on these aircraft operate at 1 200 psi. and control clearances range from 0.0001 to 0.0007 in. Further, the jet takes on 7,000 gal. during a stopover of only 15 minutes.

New refueler (photo) is Shell's answer to speedy refueling. The big truck delivers 600 g.p.m. and can complete refueling in the limited time.

Shell's head office engineers designed for one-man operation. The driver's seat and loading dock are cantilevered ahead of the front axle. Hydraulic cylinders raise and lower the loading dock for the operator to connect two fuel hoses under the wings. The refueler's engine is at the rear.

An 8,000-gal. epoxy-lined tank insure purity and capacity. A filter-separator system removes impurities and any minute quantities of water.

Brakes must be firmly locked before fuel pumps can start. Brakes release only when all equipment is secured in place.

Jet fuel purity is met by careful design and operation of storage tanks and piping. Three 20,000-gal. epoxy-lined steel storage tanks handle only jet fuel. Aviation gasoline is handled in other tanks at Shell's airport terminal.

Jet-fuel-tank suction and discharge piping is aluminum. Tanks have floating suctions which draw fluid from the top, away from any impurities which may settle to the bottom. Jet fuel is filtered both when entering storage and when transferred to a refueler. Also, fuel stands in the tanks for 24 hours before transfer to a refueler to allow for settling.

Nalco becomes fourth TEL maker

THE NATION'S fourth entry into the tetraethyl lead gasoline additives field, Nalco Chemical Co., broke ground recently in a colorful ceremony at the new plant site in Freeport, Tex.

The new plant will be Nalco's largest and will occupy about half of the 25-acre site which it bought from Dow Chemical Co.

The new alkyl lead plant will use a Nalco-developed electrolytic process instead of the conventional sodium amlgam method. Nalco has been developing and piloting the process for the last 5 years in its laboratories.

The process is part batch and part continuous. Grignard-type compounds are employed in one of the steps. The same basic process with

modifications can make other alkyl-metallic compounds.

The plant will convert about 26 million pounds yearly of lead into alkyls. This is equivalent to 40 million pounds of TEL or 34 million pounds of TML. Nalco will buy halogenated hydrocarbons, magnesium, and other feed stocks from Dow. Complete motor mixes will be formulated to customer's needs and shipped by tank car.

The plant will be an open-air type construction similar to refineries and petrochemical plants along the Gulf Coast. Interlocking and automatic controls will be installed where required.

Start up is scheduled for next June. Plant cost is in the $8 to $10 million range. Between 75 and 100 people will be employed. Fluor Corp., Ltd., is the contractor for the project.

Heaviest reactor goes up in Ohio refinery

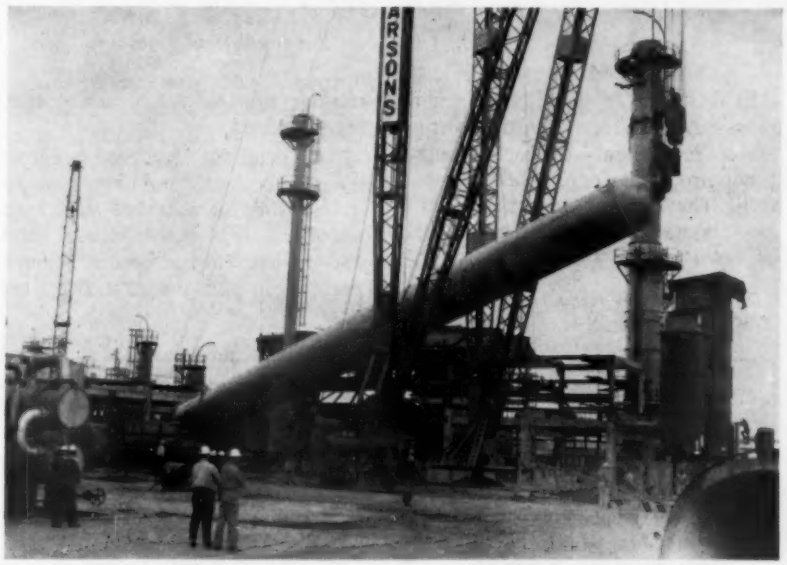
WORLD'S HEAVIEST single piece of equipment ever erected for the production of gasoline has been lifted into position at the Toledo refinery of Standard Oil Co. (Ohio).

Weighing more than 400 tons, it was shipped north by special train from Birmingham, Ala., where it was built to order by the Chicago Bridge & Iron Co.

It was lifted into place by two 160-ft. derricks and rests on massive foundations.

The huge steel reactor forms a key part of the new multimillion dollar isocracking unit now being built by Sohio at Toledo. With a capacity of 7,500 bbl. per day, the unit will convert light gas oils into gasoline or into high-quality jet and diesel fuel as desired.

The isocracking process was developed and licensed by California Research Corp. Contractor at Toledo is Ralph M. Parsons Co.



TWO 160-FT. DERRICKS lift the heaviest piece of equipment ever erected for the production of gasoline. The 400-ton reactor will be part of a 7,500-bbl. hydrocracking unit at Standard of Ohio's Toledo refinery.

First pseudocumene shipped from Texas

THE WORLD'S FIRST commercial production of pseudocumene has been shipped from Humble Oil & Refining Co.'s Baytown, Tex., refinery. It previously was a market development chemical.

Pseudocumene chemically is 1,2,4-trimethylbenzene. It is formed in catalytic reforming operations. Aromatics are extracted from the reformate and fractionation separates the extract into its aromatic component compounds.

The new chemical is a feed stock for making trimellitic anhydride, methyl dicarboxylic acids, and dimethycarboxylic acids which have potential in the surface coatings field. Also, pseudocumene can be converted into intermediates for dyes, pharmaceuticals, insecticides, fungicides, and other uses.

Enjay Chemical Co., a Humble division, is handling sales. Commercial specifications include 95% minimum purity with 98% minimum total aromatic content. Typical inspections are: boiling range 335° to 340° F., water-white color, and flash point of 123° F.

PSEUDOCUMENE is now being made commercially at Humble's Baytown refinery. The chemical is a feed stock for a wide range of intermediates which have potential in the surface-coating field.

This pipeline-simulation program recognizes batch, terrain, and temperature

It provides in seconds, answers to technical questions which, under other conditions, would require days of manual calculation

BY W. A. ZAMA
Engineer, Shell Pipe Line Corp.

RECOGNITION of oil batches and temperature effects constitutes the major refinements of earlier computer programs for pipeline simulation. The program described here has simulated operation of several of Shell's main trunk lines to determine line capacities and operating pressures.

Author Zama is presently on temporary assignment at U. S. Army, Fort Belvoir, Va.

The need for increased accuracy in oil-pipeline simulation has required the inclusion of additional variables. That is the reason batch and temperature effects are incorporated in the program described here.

Program Use

The simulation program may be used to answer technical questions about pipelines quickly and accurately, in many cases saving days of manual calculation. Here are a few typical questions that may be answered about an existing line:

What effect will a heavy tender

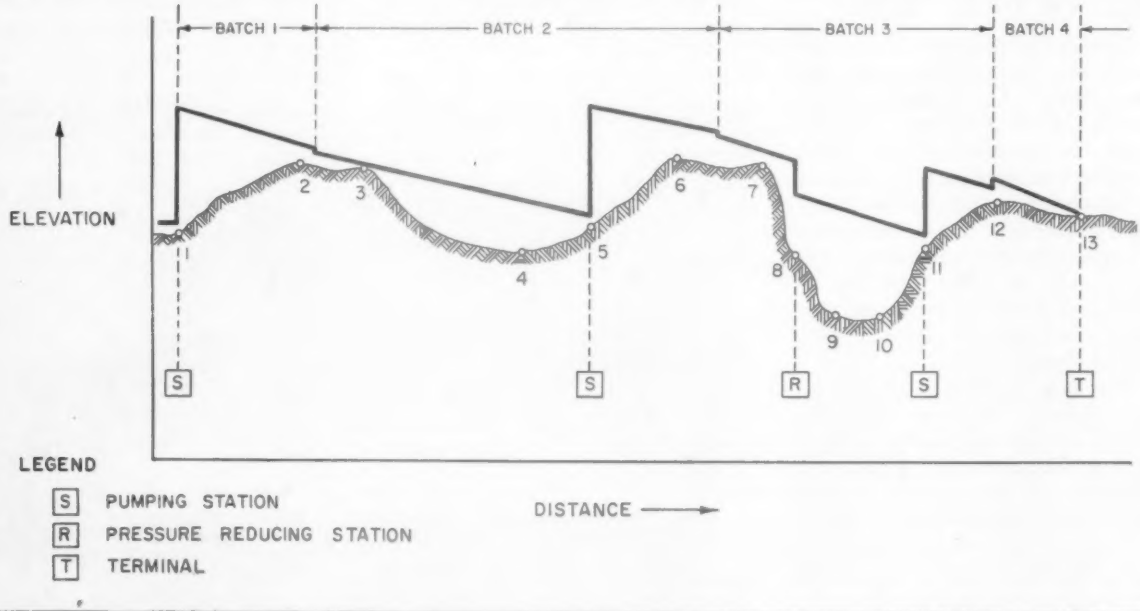
Fig. 1—Computer simulation at one instant in time.

PIPELINE PROFILE that has three pump stations and one pressure-reducing station. The line is described numerically by a series of key profile points, numbered sequentially from beginning of line. Each point is identified according to type—pump station, pressure-reducing station, ordinary control point (hill, valley), or terminal.

Associated with each key point are the following descriptive data: elevation, line fill (barrels) from beginning of line to point, equivalent length of pipe (miles) from beginning, and maximum and minimum allowed incoming pressures.

The heavy line represents line pressure, expressed in feet, for a typical set of operating conditions. Pressure is put up by pumps at pump stations, and is dissipated by friction as oil flows through line. Pressure drop per mile, which is equivalent to slope of pressure line, varies according to oil properties.

In example shown, there are four batches in line and pressure gradient changes at interfaces between these batches. For operating conditions shown, hill at point 3 prohibits an increase in throughput rate, while the pressure-reducing station is throttling to maintain safe working pressure at points 9 and 10. Pump station at point 11 is throttling slightly on minimum suction pressure so that oil is being received at terminal at tank head pressure.



have on the throughput of the line? Will it increase the power demand of the station? If so, how much more will this tender cost to move each month?

The program may be used to simulate the line with the heavy batch between two normal batches. Resulting station pressures and energy requirements may be examined and power cost tables used to determine operating costs. Also, resulting throughput rate will be furnished.

If certain pump impellers on a line are trimmed, what effect will this have on throughput and power costs?

The program may run with current pump curves, and rerun with the altered pump curves. A comparison of throughputs and power costs may be made. In addition, a complete check on resulting line pressures automatically will be furnished..

If the pressure limits on a line are increased, what increase in throughput will be allowed?

Again, the program may be run with the new pressure limits so that a comparison may be made.

The program also has utility in the design of new pipelines. Since it is general in nature, any line that can be described by profile points may be used in the program. This allows the user to try as many configurations of lines as desired, varying the data in any manner.

The number of stations, station locations, types of pumps, etc., may be varied until the best configuration is obtained.

Pipeline Simulation

A computer program has been written to simulate the operation of a generalized multistation pipeline. The program is supplied with a complete description of the line, reduced to digital form.

Line profile, operating pressure restrictions, line temperature gradient, pump characteristics, and line supervisory control features are provided. The program furnishes resultant station pressures, power requirements, and throughput rates at time intervals during the pumping period for a desired crude-batch sequence and pump-unit combination at each station.

Batches are moved forward and calculations repeated until all batches are received. The program provides the user with information such as:

1. Line capacity in advance of crude movements.
2. Operating pressures and power requirements.
3. Effects of heavy tenders on line throughput and energy requirements.
4. Examination of proposed lines or alterations to existing facilities.
5. Detection of unsafe operating conditions in advance of physical operation.

This simulation program is an extension of earlier work at Shell Pipe Line reported previously.[1, 2]

Computer simulation has received impetus in the last few years, not only from the pipeline industry, but in refinery operation, transportation, manufacturing, aircraft design, and many other fields.

The purpose of a simulation program is to have a mathematical model of a facility that can be used in advance of operation of the full-scale facility to yield information about its operation.

Accuracy of results obtained from a simulation depends upon how closely the mathematical model resembles the physical facility.

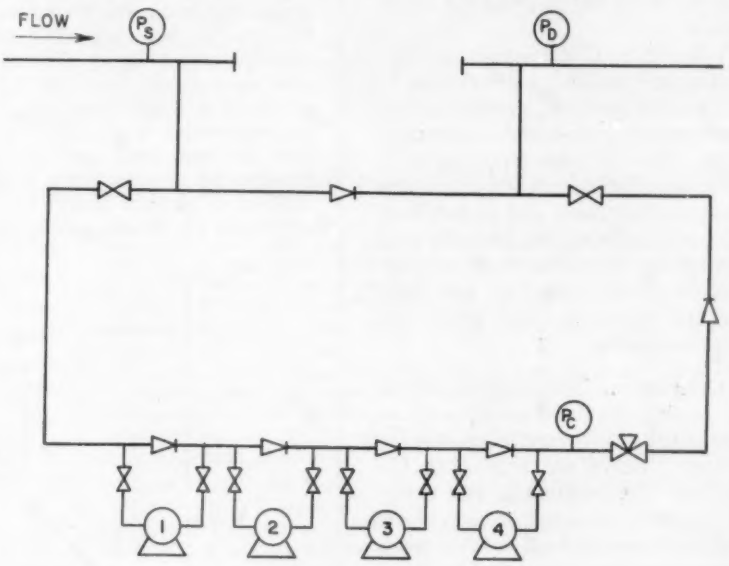
Program Description

The program was written to simulate a generalized pipeline with as many as 12 pumping or pressure reducing stations, and one receipt

Fig. 2—Illustrative pump-station pipe diagram.

PRINCIPAL PIPING at a pump station. Pressure-reducing stations are similar, with pressure-reducing devices replacing the pumps. The necessary numerical description of each station includes manifold piping equivalent length, minimum allowed suction pressure, and maximum allowed case, throttling, and discharge pressures.

Pump stations may have as many as four pumps and any combination of pumps may operate at each station. If no pumps are operating, oil bypasses station via bypass manifold. Throttling valve is set to throttle if suction pressure is too low or discharge pressure too high.



and one delivery point. Like most computer programs, it is most easily described in terms of input, calculations, and output.

Input data include a complete description of the physical pipeline, reduced to digital form. The line, Fig. 1, is described as a series of key profile points. These key points include pumping stations, pressure-reducing stations, and critical line-profile elevations.

A minimum and maximum allowed pressure is specified at each key profile point because excess pressures may cause a rupture and low pressures may cause volatiles mixed in the crude to vaporize and form vapor pockets.

These pressures permit recognition of changes in the pipe-wall thickness. Equivalent lengths of pipe are expressed in a uniform internal-diameter value. Line fill for each section of line must be included in the input data.

Pump-station piping, Fig. 2, is specified also, along with control pressures. These control pressures include minimum allowed suction pressure and maximum allowed case and discharge pressures. Each station may have as many as four pumps. Pump characteristic curves, Fig. 3, must be supplied for each pump.

In addition to description of line profile and stations, a description is required of operating conditions for the pumping period under consideration. This includes incoming and outgoing oil temperatures, operating pump combinations, and oil batches. Oil-batch information includes numerical sequence identification, size, specific gravity, viscosity, and temperature at which these properties were measured.

Calculation. The program begins by reading in the line description and operating conditions. Next, enough batches are read-in to fill the line. The program is then ready to start the pumping cycle, which will continue until all batches have been moved into the line. The cycle cycle consists of:

1. Determining the throughput rate associated with the given batch sequence in the line and operating conditions for the line.
2. Moving the batches an incremental distance down the line.
3. Reporting information associated with this move.
4. Reading in new batches to replace the ones that have been delivered.

The cycle is then repeated.

In detail, for a given sequence of batches in the line and with a specified set of pumps on, an iteration procedure is used to find the resulting throughput rate. First, a flow rate is assumed and pressures along the line profile are calculated.

If any of these pressures violate operating restrictions, the rate is adjusted and the calculations repeated until the maximum possible rate is determined. This rate is assumed constant over the short time that the batches are moved. New flow rate calculations are required each time the positions of the batches change.

Calculation of pressures along the line profile for the assumed flow rate and oil-batch sequence requires the knowledge of all batch interface positions in the line along with all elevations, specific gravities, viscosities, and lengths of pipe containing the batches.

These quantities are calculated easily because the size and sequence of batches going into the line are known. The elevations, line fills, and equivalent lengths of pipe for each profile point are known, Fig. 1, and are used in the calculations.

Linear interpolation is used to calculate interface elevations and positions between profile points, so there must be enough profile points to give accurate results. Oil properties at each point on the line depend on temperature.

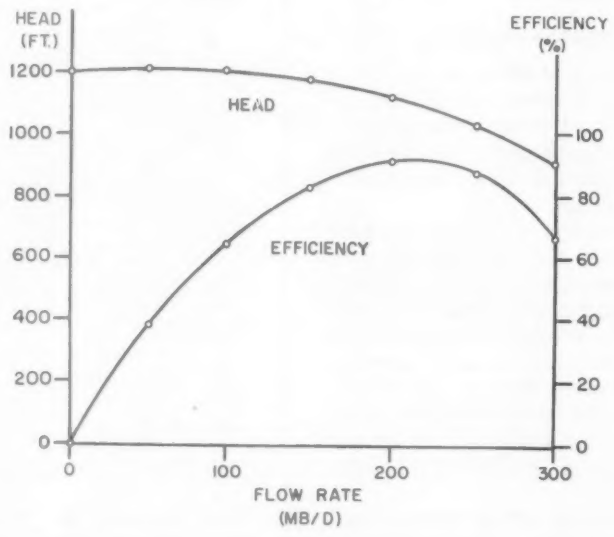
Temperatures at each point are determined by linear interpolation from input data. Relations given in the appendix are used to determine specific gravities and viscosities.

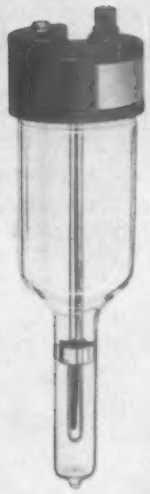
Massachusetts Institute of Technology pressure-drop relations, (see appendix) for fluid flow in commercial pipelines are used to find the pressure drop associated with each batch segment, so the pressure

Fig. 3—Typical pump characteristic curves.

OPERATING DATA for a typical high-capacity electric-motor-driven centrifugal pump. The two plots are the head-capacity and efficiency-capacity curves. Pump differential pressure at a given flow rate is proportional to head. Power required is proportional to the product of flow rate and head and inversely proportional to efficiency. Total differential pressure and power requirement for several pumps operating in series is the sum of the individual quantities.

Curves are represented in the computer program by seven data points each, which are stored in the form of tables in core memory. Quadratic interpolation is used to determine heads and efficiencies for values of flows between the given data points. A complete set of data must be supplied for each pump on the line.





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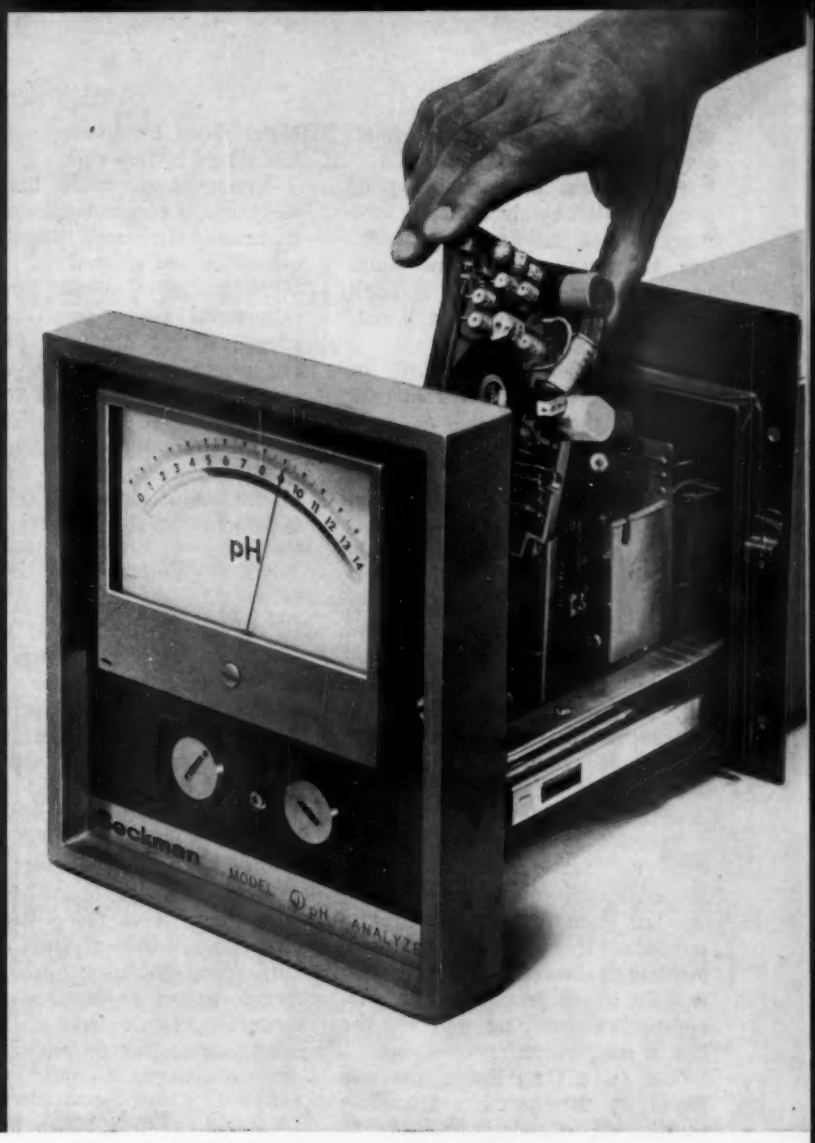

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differentials between profile points can be computed.

Pressures at each profile point are calculated by algebraically summing all the differential pressures due to pumps at stations, static heads, friction losses, and throttling, from the beginning of the line to each point.

Station differential pressures are computed from the characteristic curves for the pumps that are operating at the stations, using the properties of the oils in the station suction manifolds, Fig. 2. Throttling at a station is required whenever the suction pressure drops below its minimum allowed value.

If the incoming pressure at any profile point, for the assumed flow rate, is less than the minimum allowed value, a new smaller flow rate is assumed, and calculations are repeated. Iteration continues until the maximum flow rate that will not violate the condition is determined.

Pressure at the terminal will always be that due to tank head. Sometimes throttling is necessary at the last station to eliminate extra pressure. If throttling exceeds a maximum allowed value, provision is made in the program to drop an appropriate pumping unit off the line at that station.

The resulting throughput rate found by the iteration procedure satisfies the following conditions:

1. Pressures at each profile point equal or exceed the minimum allowed values.
2. Discharge pressures at stations equal or are less than the maximum allowed values.
3. Case pressures at stations are less than the maximum allowed values.
4. Pressure at the terminal equals tank head pressure.
5. Stations throttle only when required by a minimum suction pressure or maximum discharge pressure condition.

Output. After the correct flow rate is determined for the iteration routing, batches are moved an incremental distance down the line at this rate. They are moved until a batch interface reaches a station, or a new batch is needed to enter the line, or the current batch delivery has been completed.

Time needed to make this move is calculated by dividing total barrels moved by flow rate.

As moves are made, the movement time is accumulated along with the total of the barrels moved. These quantities are printed as program output. Station suction pressures, differential pump pressures, case pressures, and discharge pressures are printed out. Energy requirements also are tabulated for each station.

If the pressures at any of the profile points exceed the maximum allowed value, a note to this effect is printed on the output sheet.

Future Work

The present program was written to simulate a line or line segment having one oil receipt point and one delivery point. It may be extended to include multiple receipt and delivery points, and oil injections with viscosity blending and vapor-pressure control.

The program may be linked to an existing power-optimization program so that line simulation can be made in advance of each month's operations. Also, the possibility of writing a scheduling/power cost optimization/simulation program is being studied to monitor pipeline system operation from early planning stages of crude oil scheduling to final delivery of crude.

Equipment

The simulation program was written in Fortran language for an IBM 7070 computer. About 10 man-weeks were required in its preparation.

Computing time for a pipeline having 4 pumping stations and 35 profile points is about 90 seconds per batch delivered.

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APPENDIX

Viscosity—Temperature Relation*

$$\log_{10} Z = [\log_{10} Z_o + 1.7] \times [(100 + T_o)/(100 + T)]^{0.52} - 1.7$$

Where:

Z = viscosity, cs.
Z_o = reference viscosity, cs.
T = temperature, °F.
T_o = reference temperature, °F.

Specific Gravity—Temperature Relation

$$S = S_o - 0.000450\ (T - T_o)$$

Where:

S = specific gravity
S_o = reference specific gravity
T = temperature, °F.
T_o = reference temperature °F.

MIT Pressure-Drop Relations for Flow in Commercial Pipelines†

$$P = 0.241\ F\ SQ^2/D^5$$

Where:

P = pressure drop, psi./mile
F = friction factor
S = oil specific gravity
Q = flow rate, bbl./day
D = line inside diameter, in.
R = modified Reynolds number
z = kinematic viscosity, cs.

F is determined below, according to whether flow is laminar or turbulent.

$R = 0.0119\ Q/Dz$

If $R \leq 0.135$, flow is laminar and $F = 0.00207/R$

If $R > 0.135$, flow is turbulent and $F = 0.0018 + 0.00662\ R^{-0.355}$

*Watson, Industrial Engineering Chemistry, 28 p. 605, 1936.

†Contribution No. 19, Department of Chemical Engineering, Massachusetts Institute of Technology, by Wilson and McAdams.

Another Journal Exclusive:

What to expect from oil's biggest customer

NEXT WEEK, The Oil and Gas Journal will feature its annual forecast of military fuel demand.

This exclusive report, based on new estimates released by the Defense Department's Division of Petroleum Logistics, gives the outlook for the next 5 years. This includes demand for avgas, jet fuel, motor gasoline, distillate, Navy special, and other residual.

Watch for this timely feature in the Journal's October 30 issue.

Contamination formulas for catalysts have limited usefulness

BY W. L. NELSON
Technical Editor and Petroleum Consultant

We use the nickel equivalent as copper plus nickel plus vanadium divided by 4.3 as a measure of cat cracker feed quality. Others apparently consider iron to be important. What other formulas are in use? G. M. D.

The various formulas are viewed with such doubt that only the most meager information has been released. Several relationships are discussed on Page 782 of the 1958 Edition of Petroleum Refinery Engineering.[4] Various formulas or implications from the literature are assembled in Table 1 resulting in somewhat the following average (modified by some weighting) formula for the feed to fluid units:

$$\text{Ni equivalent} = \text{Ni} + \frac{\text{V}}{4.8} + \frac{\text{Cu}}{1.23} + \frac{\text{Fe}}{7.1}$$

A quite different relationship results if data on contaminants in catalyst (rather than feed) are examined. Copper appears to be less harmful and other metals are nearly as harmful as nickel.

Although some of the formulas and ratios of Table 1 may be based on laboratory experiments, it appears that some of the data are only an opinion, or working formula (because some basis must be employed) upon which plant operation is based. A feeling that these simple formulas are not as significant as once thought is beginning to be apparent.[7,9] Iron rust or rouge (from the equipment) appears in the catalyst and it seems to have little or no effect on catalytic behavior. As more and more plant experience accumulates, experts[9] appear to be less, rather than more, convinced about the relative effect of various metals.

During 1958-1960, the Davison Chemical Division published[10] the activities and metal composition of fluid synthetic catalysts in use in the United States. The reports are plotted in Fig. 1. Although the copper, nickel, and vanadium in the catalyst have been decreasing since 1957, the iron may have been increasing, and the sodium came to a maximum in 1959 and has since decreased.

Nevertheless, only small changes in activity have resulted, and if anything is evident from Fig. 1, it is the possibility that sodium and iron may have been more important in causing catalyst deterioration than the metals which are ordinarily blamed. One refiner[9] reports that after the amount of nickel and vanadium had reached high values with deterioration of the conversion attained in the unit, the contaminants in the feed were reduced, whereupon the operation was improved even though the amount of metals in the catalyst remained high.

TABLE 1—INDICATIONS OF THE RELATIVE EFFECTS OF METALS (IN FLUID CRACKING) ON CRACKING-PLANT FEED QUALITY. EFFECT OF NICKEL IS 1.0

Ref.	Ni	V	Cu	Fe	Cr
2	1.0	0.20	1.0	0.20	...
*1, and *4	1.0	0.286	0.0715	0.715	...
2	1.0	0.232	1.0	Zero	...
3 and 4	1.0	0.20	0.20	0.20	...
4	1.0	0.10	1.0	0.10	...
4	1.0	0.267	0.667	0.15	...
5	1.0	0.25	....	....	...
6	1.0	....	1.0	0.10	...
†7	1.0	0.20	....	....	...
7	1.0	0.20	....	0.16	...
*8	1.0	0.60	....	0.70	...
*8	1.0	0.20	....	1.0	...
*8	1.0	0.75	....	1.0	0.71
Avg. on feed	1.0	0.208	0.81	0.14	...
Avg. in cata.	1.0	0.459	0.071	0.693	0.71

*Based on catalyst, not feed. †TCC process.

This and other experiences seem to indicate that decreases in catalyst performance are related to the reaction at the time the contaminant contacts the catalyst and that once the metal has been incorporated into the catalyst little further deterioration occurs (due to metals). Some experts conceive of metal contaminants under some conditions as "fresh and active poisons" but under other conditions as much less troublesome[18].

In an effort to resolve the riddle of metal effects, the author spent 2 days trying to develop an empirical formula from 21 sets of data published in the Petro/Chem Engineer (Dec. 1960, p. C-30) on the activity and composition of commercial fluid catalysts. The final formula was (in terms of weight per cent of each contaminant):

$$\text{Activity} = 3{,}400\,\text{V} - 1{,}785\,\text{Ni} - 123{,}000\,\text{Cu} + 27.4\,\text{Fe} - 60\,\text{Na}_2\text{O}$$

This indicates that copper is very powerful (70 times that of nickel), sodium oxide has very little effect (1/30 that of nickel), increased vanadium improves the catalyst activity, and iron quantities turn out to be negative when other metals are held constant. Conner et al.[11] report a similar behavior for vanadium—"In actual weight per cent of carbon yield based on feed, it (vanadium) rated second to nickel as a carbon producer but because it **increased slightly** rather than decreased the conversion, it must be rated lower than zinc, chromium and iron."

Donaldson et al.[14] found that vanadium, at least, does not deactivate with age. However, there is no real justification for the strange behavior indicated by the equation. The equation only emphasizes the difficulties in trying to isolate the many effects and conditions which influence the phenomenon of catalyst poisoning. The equation is very poor because experimental activities of 25-35 are found to range by the equation from −32.4 to +106.8.

This very poor behavior can only be explained by (1) faulty experimental data, (2) erroneous data affects the values of constants other than the

one to which it applies (i.e., the equation form is incorrect), and (3) faulty assumptions such as the assumption that each metal behaves independently of the others, or that only one type of metallic compound appears in all oils.

The usefulness of simple equations is so doubtful that most refiners prefer to work toward the best possible performance without regard to contamination formulas or to learn by operating experience what can or cannot be tolerated by the cracking unit. There are at least three types of metal contaminants each of which may behave differently with regard to catalyst poisoning[12]. Thus, a constant amount of contaminant in the feed material can produce different degrees of poisoning. Refiners frequently state[7] that the metals in the oils from some crude sources are nearly harmless whereas oils from other sources cause much trouble even at low levels of contamination. McIntosh[8] and many others point out that-activity catalysts are affected differently from low-activity catalysts. The various metals also affect the catalyst differently[13]. Thus, sodium causes a loss of surface area but only at concentrations of 0.5% or more, whereas nickel, iron, and most other metals are thought to act by causing loss of activity per unit area. Plain sintering may be significant, and some contaminants (such as iron rust from the equipment) may behave primarily as an inert material.

Finally, how are we to measure the poisoning caused by metals? Is catalyst activity[16] a proper guide, or per cent carbon deposition[6 16], conversion[11], gas production[6], hydrogen production[16], D + L[11], coke producing factor[11 15], butanes production[16], gasoline production[6 16], or what? Metals may behave differently with respect to each of these means of measuring contamination[11], and in addition each type of catalyst (synthetic, clay, high activity, bead, fluid, etc.) may react differently to each metal with respect to the various means of measuring contamination.

Relatively little difficulty has been found with metal poisoning of bead catalyst. Apparently about 70% of the contaminant is currently eliminated from the system as dust which is worn from the surface of the beads[17]. Much of the metal appears in the 5% of material at the surface (35 μ depth) of the bead.

The state of the art is such that one should not place much confidence in formulas of metal equivalents. Nevertheless, some method of measuring total contamination must be used and in this sense the formulas are useful if their limitations are always kept clearly in mind.

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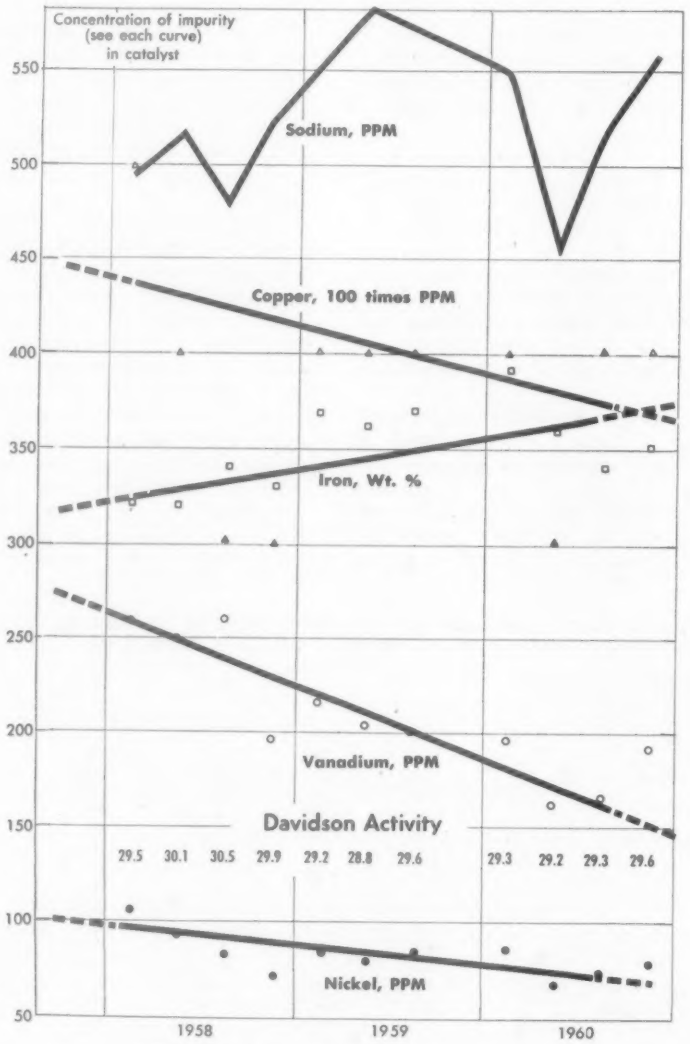
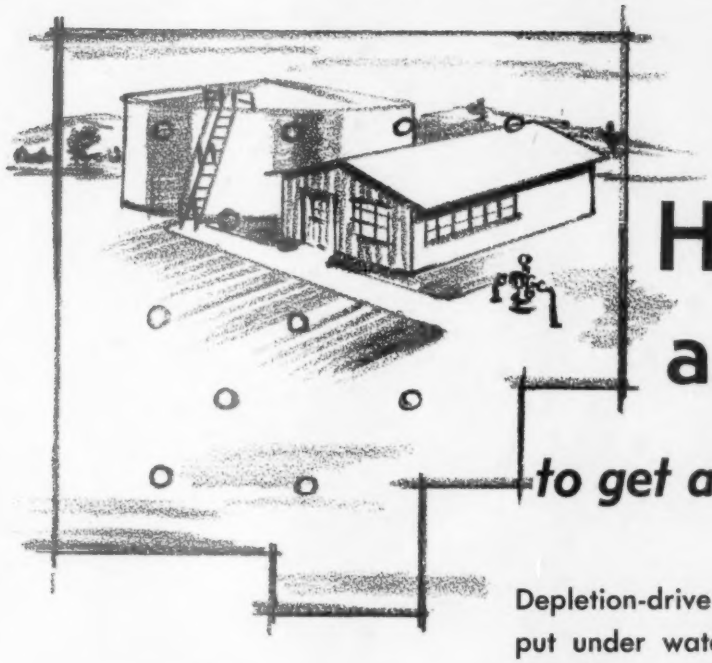


ACTIVITY and metal contamination. Fig. 1.



How to form a unit fast...

...to get a water flood started

Depletion-drive fields in the Denver basin should be put under water flood as soon after discovery as possible to avoid losses in ultimate recovery. All-out efforts of Pan American Petroleum Corp. in getting units formed quickly has been paying off in a big way.

BY A. M. RONEY
AND NORMAN J. RUBASH
Pan American Petroleum Corp.
Casper

EARLY EFFORTS to unitize Denver basin fields were disappointing.

Pan American Petroleum Corp.'s history in this area dates back to 1954 when negotiations were started to unitize Enders field, Kimball County, Nebraska. The Enders unit, operated by Shoreline Petroleum Corp., did not become effective until June 1, 1956, and water injection did not get started until 7 months later.

Early studies showed that either gas or water injection would be beneficial in other fields in the basin, and by the time water was being injected in the Enders unit, Pan Am was negotiating with other companies on unitization of four other areas.

By the end of 1957, results of water injection in Enders field were encouraging, but negotiations in the other four fields had bogged down in engineering studies. With a 60% increase in ultimate recovery at stake, it was obvious that something had to be done to speed up the unitization efforts, before the fields under consideration were depleted.

Pan American's management recognized that the time had come to introduce some time-saving methods, and these were put into effect without delay.

Time Savers

A review of experience in unitization showed that there were three major steps which could be taken to shorten the time lapse between the day when the need for water injection was first established and the day injection actually got under way.

- Eliminate committees wherever possible, particularly the engineering subcommittee.
- Use industry-recognized forms of unitization agreements and accounting procedures.
- Carry out the various phases of unitization and facility design and construction concurrently.

Elimination of committees. After months of activity, the engineering-subcommittee studies which were under way still had unresolved technical problems. Long-drawn-out studies may have their place in large fields with enormous reserves and long life, but in the Denver basin they were proving more hindrance than help.

To eliminate subcommittee studies, Pan American began preparing engineering reports for each of its basin fields. These reports were intended for release to the other working-interest owners. Each report set out the benefits of water flooding the particular field, the economics involved, and a recommendation that the working-interest owners initiate unitization efforts. The reports contained a tabulation of all conventional unitization parameters set out by leases and summarized for each operator.

No particular participation formula was recommended in any report, and every effort was made to keep the reports completely impartial.

Since most of the basin fields are small and have similar reservoir and fluid characteristics, a rigorous reservoir study was not made in each case. Instead, analogies were used, based on a detailed, comprehensive study of Sloss field, Pan Am's most important basin field. Thus, a single rigorous and somewhat lengthy study was made to serve for numerous small fields.

Adapted from "Streamlined Unitization and Planned Water Flooding Pay Off in the Denver-Julesburg Basin," presented at the spring meeting of the Rocky Mountain District, Division of Production, API, Casper, 1961.

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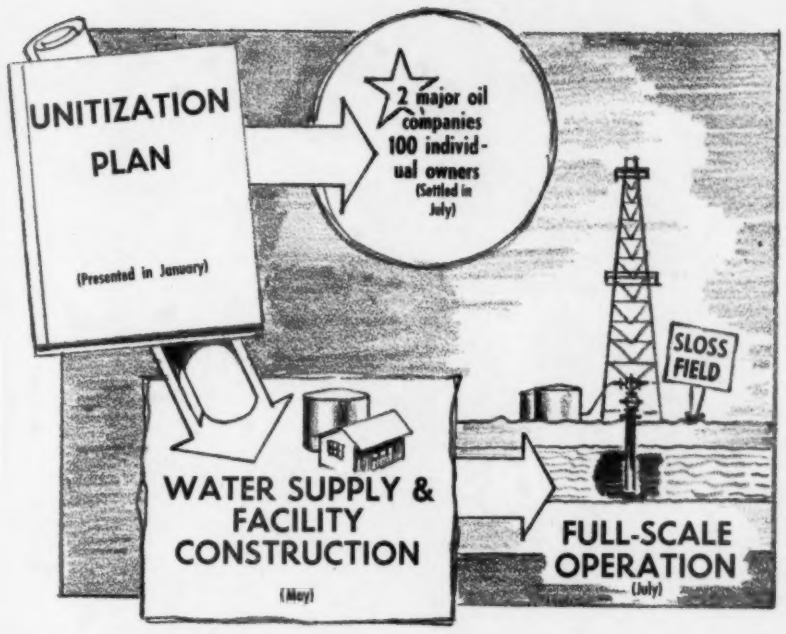

This particular short cut, possible in the Denver basin, has somewhat less widespread application than do some of the other time-saving techniques. Even where individual rigorous studies must be made, however, the advantage of eliminating the engineering subcommittee is great.

The elimination of the legal and accounting subcommittee was made possible by the use of industry-recognized unitization forms. Essentially all decisions on the agreements were made at the working-interest owners' meeting.

Standardized unitization agreements. Throughout much of this history of unitization the drafting of acceptable unitization agreements has been a time-consuming task which often delayed formation of units.

The problem of drafting agreements was largely resolved by the Model Forms of Unit and Unit Operating Agreements published in 1957 by the American Petroleum Institute. Growing acceptance of these forms by the industry has proved a boon to unitization. Instead of taking weeks to reach a decision, Pan American, by using the API model forms in each of its basin units, was able to finalize agreements with an average of less than 1 hour of discussion among all operators. A revision of these model forms by the Subcommittee on Unit Agreements (of the API Steering Committee on Production Practice) has recently been completed.

The use of the API model forms proved beneficial in signing up royalty owners. Initially royalty signup was time consuming because local attorneys were almost totally unfamiliar with unitization. As the attorneys became more familiar with the API agreements with each successive unit, royalty signup took much less time. This would not have been the case if each agreement had been separately prepared by the working-interest owners without reference to any standard form.

The accounting procedure which is conventionally made an exhibit to the unit operating agreement was also shortened by use of a standard form. In the Denver basin, Pan American used the form developed by the Public Accountants Society of Oklahoma (PASO-T-1955-2) with striking success.

Another problem associated with the accounting procedure is the determination of controllable or noncontrollable equipment for investment adjustment purposes and for normal unit operations. Accounting procedures vary from company to company in this regard. In the interest of speeding up unitization, the PASO manual was accepted by all working-interest owners as the guide in each basin unit. In the absence of industry standards, an accounting subcommittee would have been forced to iron out many dif-

WELL
PROBLEMS
EATING UP
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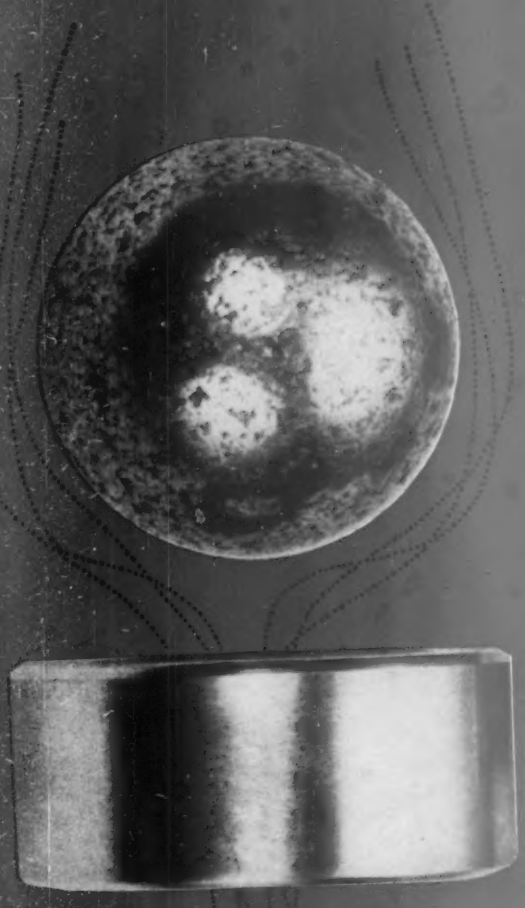

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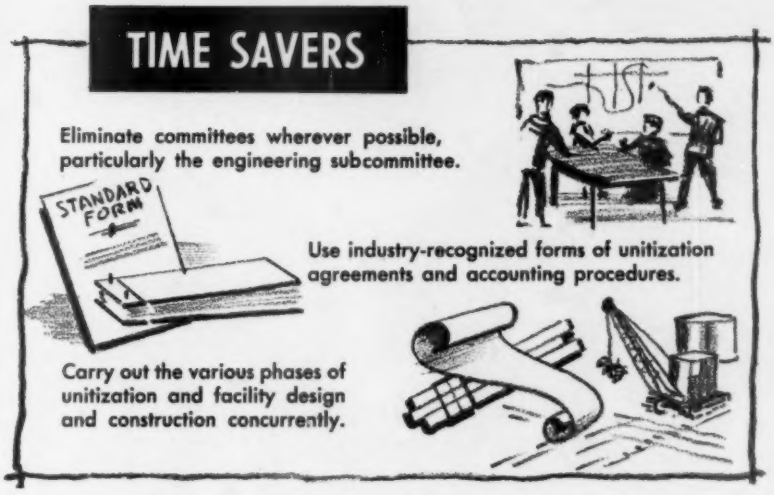

TIME SAVERS
Eliminate committees wherever possible, particularly the engineering subcommittee.
STANDARD FORM
Use industry-recognized forms of unitization agreements and accounting procedures.
Carry out the various phases of unitization and facility design and construction concurrently.

ferences among companies.

Some flexibility is required even when standard forms are used, and it is not suggested that all units can or should be set up strictly on the basis of standard forms. Many units have distinctive problems which require special handling. It cannot be overemphasized, however, that unnecessary deviations from industry-accepted forms merely satisfy the preferences of an individual working-interest owner do a disservice to the cause of unitization by undermining the value of the forms. Fortunately the similarity of fields in the Denver basin was such that little or no special handling was required.

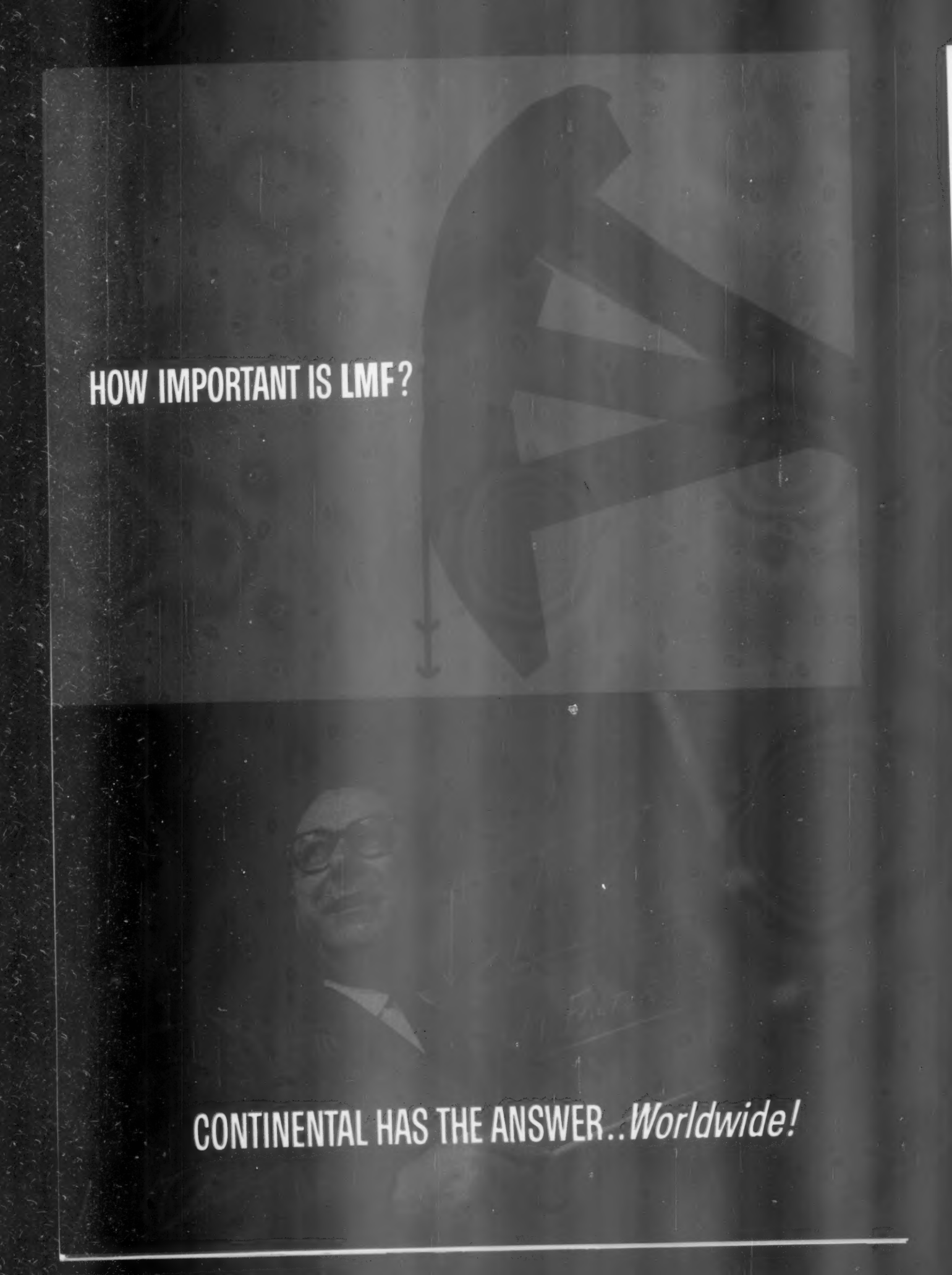
Simultaneous activity. There is a tendency in complicated negotiations to take up each item in order. Often unitization agreements, accounting procedure, and other matters are not discussed until unit participation is finalized. If negotiations become stalemated in midafternoon, the tendency is often to adjourn the meeting rather than move on to other problems. Thus, if three separate meetings are required to finalize participation, three opportunities to complete all other phases of negotiations are wasted. Similarly, problems concerning the design and construction of facilities are left unresolved until the unit becomes effective. To avoid undue delays, all work needed to start injection of water should be carried on simultaneously.

When calling the initial working-interest owners' meeting, Pan American provided all parties with an initial draft of the unitization agreements, including the accounting procedure, with the request that they be reviewed so that they could be finalized at the initial meeting. If participation negotiations bogged down, the agreements, accounting procedure, and other matters were discussed and finalized. After this was done, it was often possible to go back and negotiate further on participation with favorable results.

This approach resulted in most units being formed in either one or two meetings, with tentative agreement in some cases being verified by a mail ballot after all representatives had a chance to consult with their respective managements.

The most discouraging situation that can arise at a working-interest owners' meeting is for a representative to come without authority to act. The need to provide a proposed agenda well in advance of the meetings, and to pointedly request that each working interest have a representative in attendance with authority to act on all agenda items, cannot be overemphasized. Although largely successful in this regard, some delays were occasioned by representatives who came only as "observers."

The need for simultaneous activity extends beyond the unit negotiations. To assure that the injection could begin on or shortly after the effective date of each unit, it was necessary to fully coordinate unitization negotiations with the actual facility construction in the field. Consequently, as soon as all parties agreed to unitization in principle and negotiations got under way, Pan American secured the approval of all working-interest owners to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11-31

proceed with the development of a water supply and construction of facilities. In those units in which participation was finalized at the first meeting, it was possible to immediately determine each working-interest owner's share of costs. Where participation was not finalized, Pan American advanced all moneys for construction upon agreement by the other parties to share such costs as a unit expense upon the effective date of the unit. It should be recognized, however, that Pan American had a predominant interest in the units where this approach was followed.

New Techniques in Practice

To see the concrete results achieved by these short cuts, let's examine an actual case. Pan American's all-out secondary-recovery effort in the Denver-Julesburg basin began with Sloss field, Nebraska's largest oil field, located 5 miles south of Kimball. The field was Pan American's most important reserve in the basin and, inasmuch as Pan American owned 69 of the then 80 wells in the field, it was the obvious place to initiate new techniques. Even if efforts to form a field-wide unit had proved unsuccessful, Pan American could have—and no doubt would have—initiated a flood on its own properties by unitizing the royalty.

A rigorous reservoir evaluation by Pan American indicated that through water flooding, recovery from Sloss field could be increased by at least 60% of original primary oil. Laboratory tests showed that connate brines were compatible with water from shallow wells in the field and that no detrimental clay swelling occurred when shallow water was injected into core samples. Based on the reservoir study, the engineering design of water-injection facilities was completed in early 1958.

Armed with a complete plan of unitization, Pan American approached the other operators in the field. Two were major oil companies, three were independents operating properties on behalf of almost 100 individual working-interest owners. Contacts with the latter were handled principally by mail. The initial personal contacts were made on January 21, 1958; the unit became effective slightly more than 5 months later on July 1, 1958.

A water supply was developed within the field in March 1958, and construction of the injection plant and other facilities began in May, 2 months before the effective date.

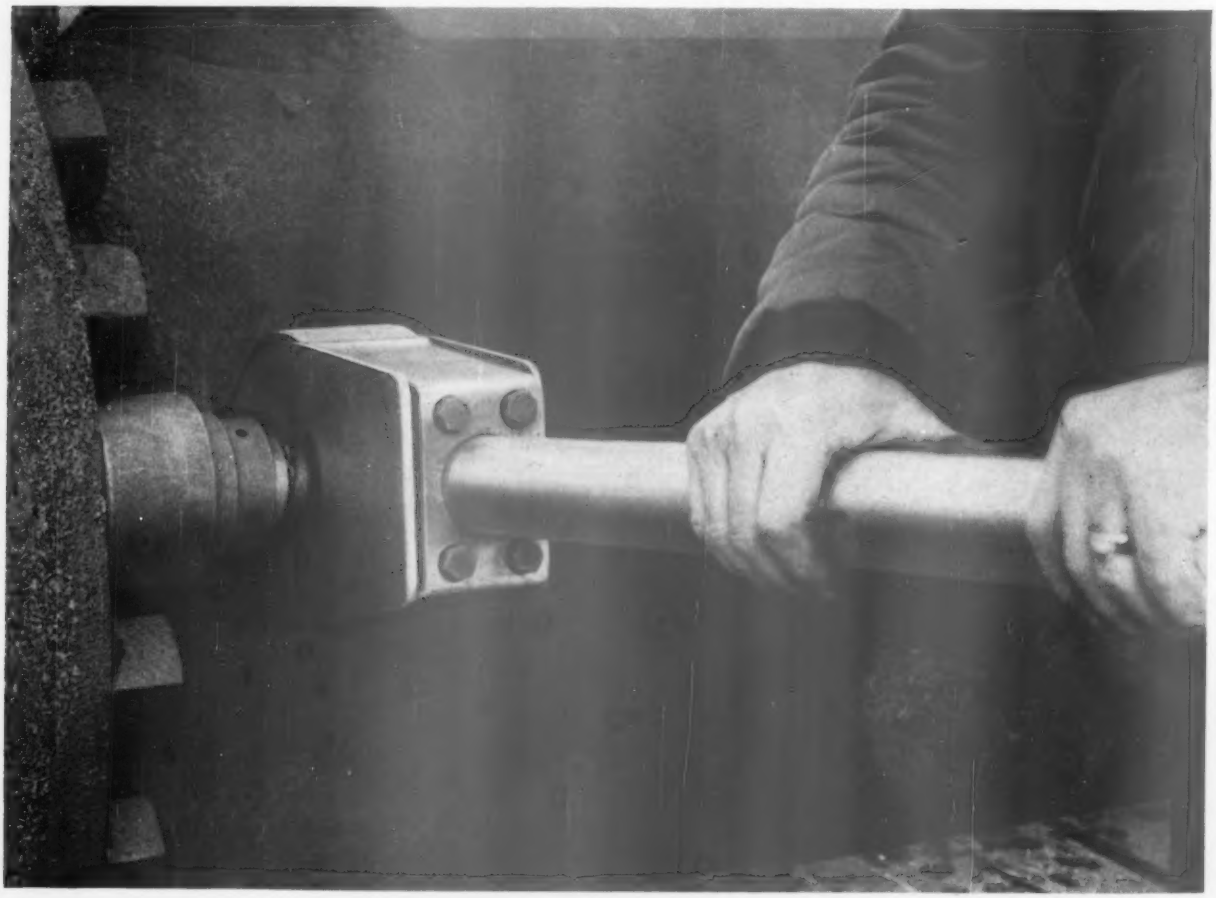
As a result, full-scale injection was under way on the effective date of the unit. Of the four previously discussed basin fields being unitized in late 1956 by other operators, only one became effective in advance on the Sloss unit and even in that instance, water injection did not begin until some 2½ months after Sloss injection was under way. One of the four did not become effective until more than 2 years later.

Omitting one exceptional case, the units initiated by Pan American after Sloss was formed required an average of only a little more than 6 months to form. The shortest length of time required was 3½ months, the longest 10½ months. The exceptional case, the Kimball unit, required 20 months. There, matters were complicated by the fact that a large portion of the field underlies the City of Kimball. Also, the working interest in the townsite wells had been divided among numerous working-interest owners. All told, that unit when formed included 758 royalty owners and 646 working interests. Except for the Kimball unit, all basin units formed by Pan American after Sloss were negotiated at meetings of all operators in each field. The 1,400 interest owners in the Kimball unit made meetings impossible and unitization was handled by mail and personal contacts.

Although they did not approach the magnitude of the Kimball unit, most of the units had rather diverse ownership, both as to royalty and working interest. To complete signup as quickly as possible contacts were made successively by letters, wires, and telephone calls. If these met with no success, personal contacts were made. On the whole, roughly 80% of the signup was handled without a personal contact.

The importance of the water floods now under way in the Denver-Julesburg basin lies in the example they set. The streamlined practices which led to their formation might well be applied in whole or in part throughout the industry during the coming years as secondary recovery becomes more important.

the SWENCH® is a wrench like no other — and will work where no other can. It's the world's first manual impact wrench. Loosens frozen nuts and bolts in seconds . . . tightens with precise accuracy every time. SWENCH is completely portable . . . needs no outside power — yet multiplies torque many times. It safely handles more bolt sizes than any comparable power wrench, but costs less. Read how you'll save with the SWENCH:



SWENCH® cuts man-hours on Bayway Refinery jobs

At Humble's Bayway Refinery, there are a lot of tough bolt and nut loosening jobs — and there are SWENCH wrenches in all tool cribs!

For over three maintenance-free years, SWENCH has been loosening bolts and nuts exposed to heavy coking, prolonged exposure to high temperature and corrosion. Typical savings with the SWENCH — 14 man-hours removing 28 big bolts on the yoke and gear of a Chapman gate type valve. Comparable savings on loosening 2" studs on heat exchangers and product coolers.

The amazing SWENCH works anywhere, carries its power built-in. Exerts many times the energy needed to pull the handle, smoothly and evenly: gives you more power with greater safety.

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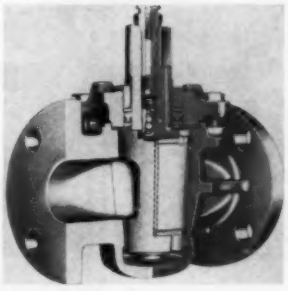
Valve with plastic-coated plug

A NEW concept in tapered plug-valve design has been brought out which uses a high-lubricity plastic coating that substantially reduces the turning effort required compared to bare plugs. Called the Permaturn, the valve comes in sizes from ¼ to 36 in.

For pressures to 1,000 psi., the plug is coated with teflon; for pressures up to 10,000 psi., the plug is coated with phosphate-molybdenum disulfide.

In addition to the coating, the new valves incorporate two other features designed to reduce the frequency of maintenance. One is a fixed adjustment assembly used on the low-pressure valves to maintain a constant tight seal after repeated operation and to facilitate uniform



turning ease. The other is designed for valves on extreme high-pressure service and consists of a threadless stem that results in a reduction of the high operating torques of conventional high-pressure valves. Source: **Rockwell Mfg. Co., Meter & Valve Div.,** 400 N. Lexington Ave., Pittsburgh 8, Pa.

Portable herbicide spray unit simplifies weed control

WEED and brush control in refineries and other process plant yards and along pipeline right-of-way can be accomplished on the ground with a new portable handgun spray unit that has been brought out. It uses a nondrift invert herbicide.

The new device sprays at distances to 50 ft. Combined with the viscous spray, the unit is said to provide pin-point spraying accuracy and to prevent any possibility of drift in spraying.

Weighing about 100 lb., the sprayer can be transported and operated from a pickup truck without anchoring. Powered by a 7½-hp. air-cooled engine, the pumping unit is designed so its output can be readily varied over a wide volume and pressure range. Source: **Stull Chemical Co.,** 3400 Nacogdoches Rd., San Antonio, Tex.

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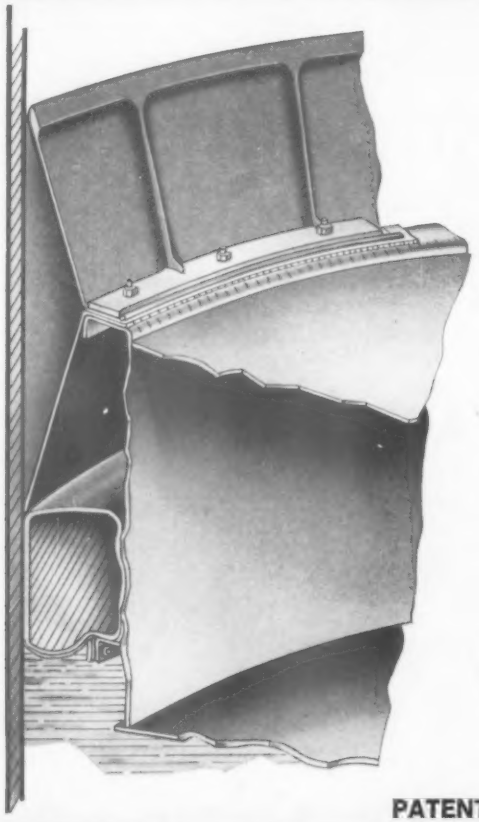

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Tubeseal electro-conductive weather shields are an *exclusive tried and proved development.* They provide positive protection against lightning-caused rim fires. ■ How? By maintaining a *continuous* grounding bond between roof deck and shell—concentration of static charges is impossible. There has *never* been a lightning fire where any of the many hundreds of Tubeseal System Floating Roof Tanks are installed throughout the world—they're "lightning proof." ■ This is scientific and safe storage protection for the entire range of volatile products. Tubeseals can be installed on any of your tanks—new, old, riveted, or welded. You owe it to the future safety of your conservation facilities to investigate. Send for the Tubeseal Bulletin now—it could be important.

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Sucker rod for heavy pump loads

A special-alloy sucker rod has been developed to meet the need for a rod with the strength to carry heavy pumping loads in noncorrosive fluids, or mildly corrosive fluids which can be effectively inhibited.

The maker says that, where corrosion is not a problem, it is more economical to use this new Type S sucker rod than to use more-expensive high-tensile-strength rods which are designed to resist corrosive fluids.

The Type S rod is a chrome-moly type with a tensile strength of 130,000 psi., available in four sizes: ⅝, ¾, ⅞, and 1 in. Optional is a stress-relieved pin with rolled threads. Source: **Liberty Mfg. Co. of Tex.,** 4025 Hemphill, Fort Worth, Tex.

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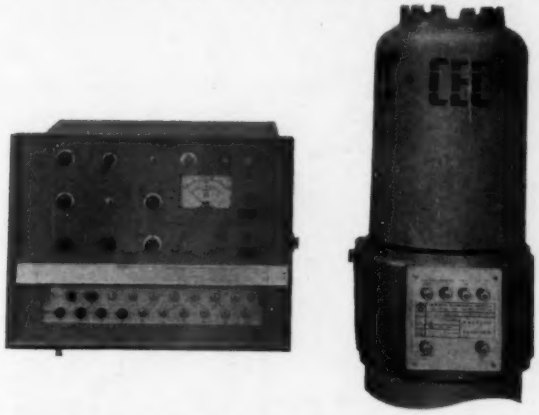
New electrical enclosures

A completely redesigned line of starter and circuit-breaker enclosures for hazardous and special-purpose applications has been brought out which is designed to be functional yet eye-appealing. Compared to older types, the White Line enclosures require fewer flange bolts as the enclosure is tailored to the equipment.

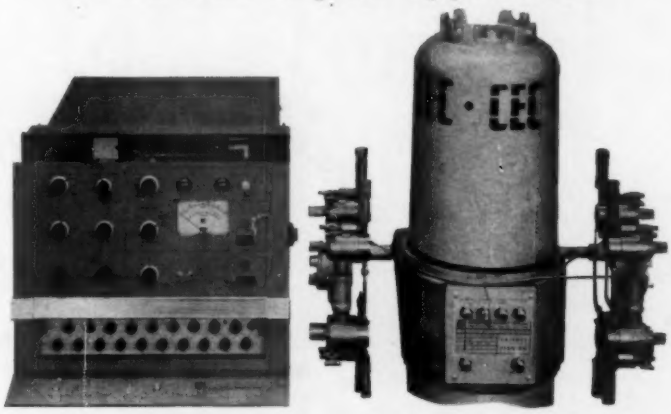
The flange bolts are a stainless-steel captive type to prevent loss. They are also a quick-thread type requiring only 1½ turns to remove them.

The cover features a raised ridge which strengthens the cover and provides a protective recess for hand controls. The designer used a white

This CEC Chromatograph



is tailored to your application



As your needs change, simply modify it!

CEC's 26-212 Chromatograph is *engineered* to be modified in the field. There's plenty of room inside the control unit to install off-the-shelf components that will adapt it for monitoring up to eight separate streams. Fixed or continuously variable attenuation also is available for one to nine components or component groups. In closed-loop applications, this permits controlling one stream while monitoring up to seven others.

And the analyzer is just as flexible. Provision is made for installation of precut, backflush, or multiple-column components. A liquid valve manufactured for CEC by Pasco permits high-boiling liquid samples to be injected directly at the head of the column without prior vaporization. And, instrument sensitivity can be substantially increased using an accessory amplifier.

For complete information, call your nearest CEC sales and service office or write for Bulletin CEC 26212-X5.

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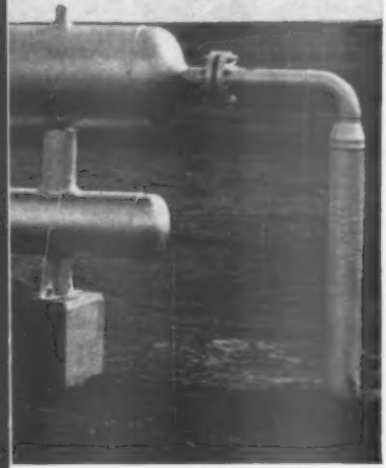
Complete technology on glycols in operation of low temperature separation units is readily available. Dow representatives, distributors, and technical personnel from Dow's Gas Conditioning Laboratory are available for consultation.

Fast, efficient delivery of glycols for hydrate inhibition and dehydration, as well as amines for sweetening, is assured by Dow's network of production plants, terminal facilities, and their distributor warehouses.

Dow's active participation in gas processing research continually turns up improvements or cost reductions in processing and laboratory techniques. For assistance in gas conditioning problems, or for complete procedures for setting up your own testing facilities, get in touch with your nearest Dow sales office, Dow distributor, or contact Dow in Midland, Michigan.



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is a good description of the Barton 257 differential pressure indicating switch. Accurate, responsive, easy to read and infinitely dependable, the 257 is ideal for energizing alarm circuits when limits of flow, level, or differential pressure are exceeded. Like many Barton instruments, the 257 D.P. switch has as its heart the rupture-proof dual bellows Barton meter body—proved beyond doubt to be the finest in the field. For new standards of accuracy and dependability in your measurement and control instruments, look to the leader—buy **BARTON**®

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color for the enclosures as it is considered the best heat-reflective color. This characteristic helps keep the enclosure interior cool, preventing nuisance tripping and permitting more accurate selection of overload heaters.

One feature of the starters for hazardous areas in refineries and petrochemical plants is a concept called Electrol. This concept features complete plug-in components to make changeout fast so that down time will be minimized. Line, load, and control wiring are disconnected when the interior is removed. Source: **Nelson Electric Mfg. Co.**, 4041 S. Sheridan, Tulsa, Okla.

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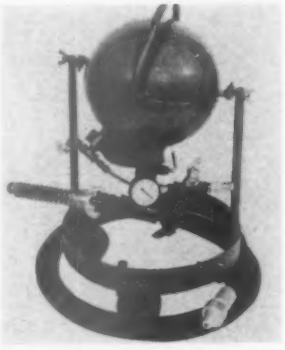

Sand-blasting machine

One man can make spot repairs to coated surfaces, in places virtually inaccessible, with this new portable abrasive blasting machine. He can either pull it along to the job site or carry it. All control equipment swings beneath the machine into a protected position. A special metering valve permits the use of extremely fine abrasive for etching or wood work yet is adjustable for conventional abrasives. Source: **Andersen Mfg. Co.**, 6826 Lynford, Philadelphia 49, Pa.

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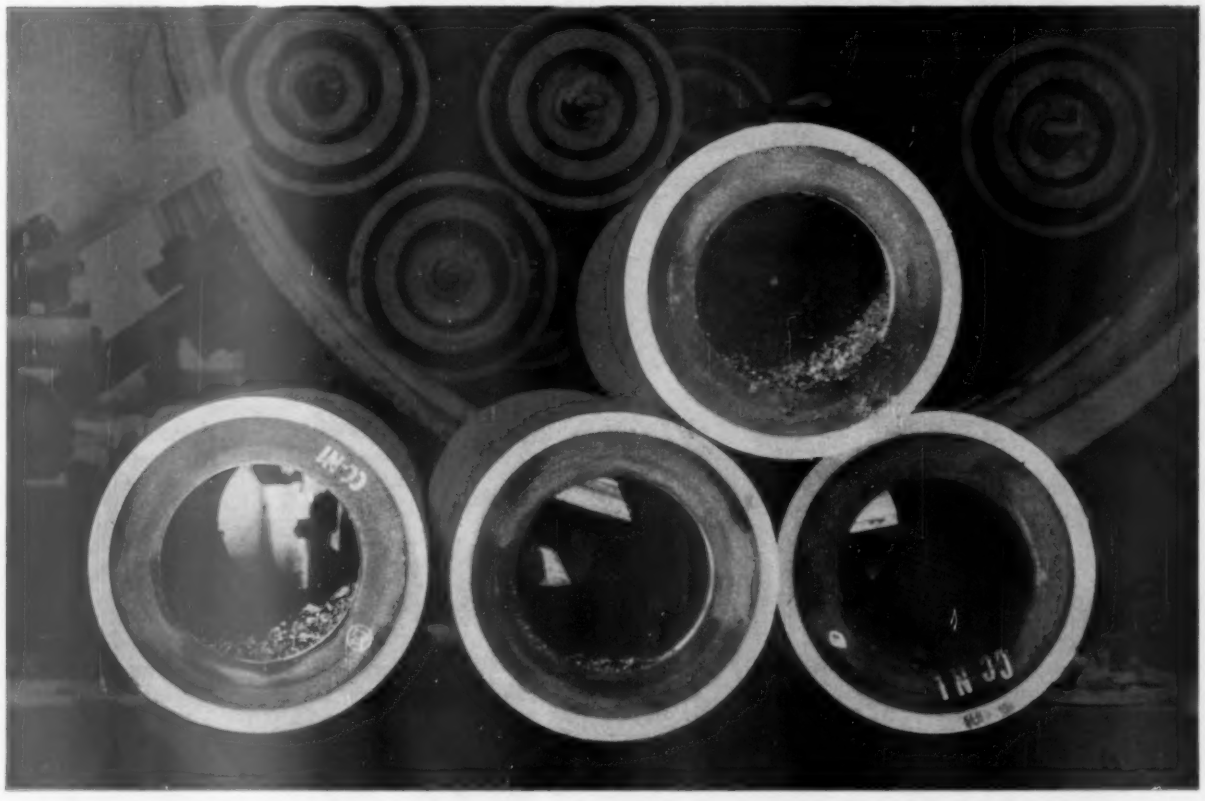
New emulsion treater for crude

A chemical - electric crude - oil emulsion treater has been brought out that combines the efficiency of the maker's electric precipitation with the effectiveness of their chemical demulsification to reduce heat requirements to a minimum.

According to the maker, the Chemelectric treater is simple to install, provides automatic operation at minimum treating temperature,

PROOF



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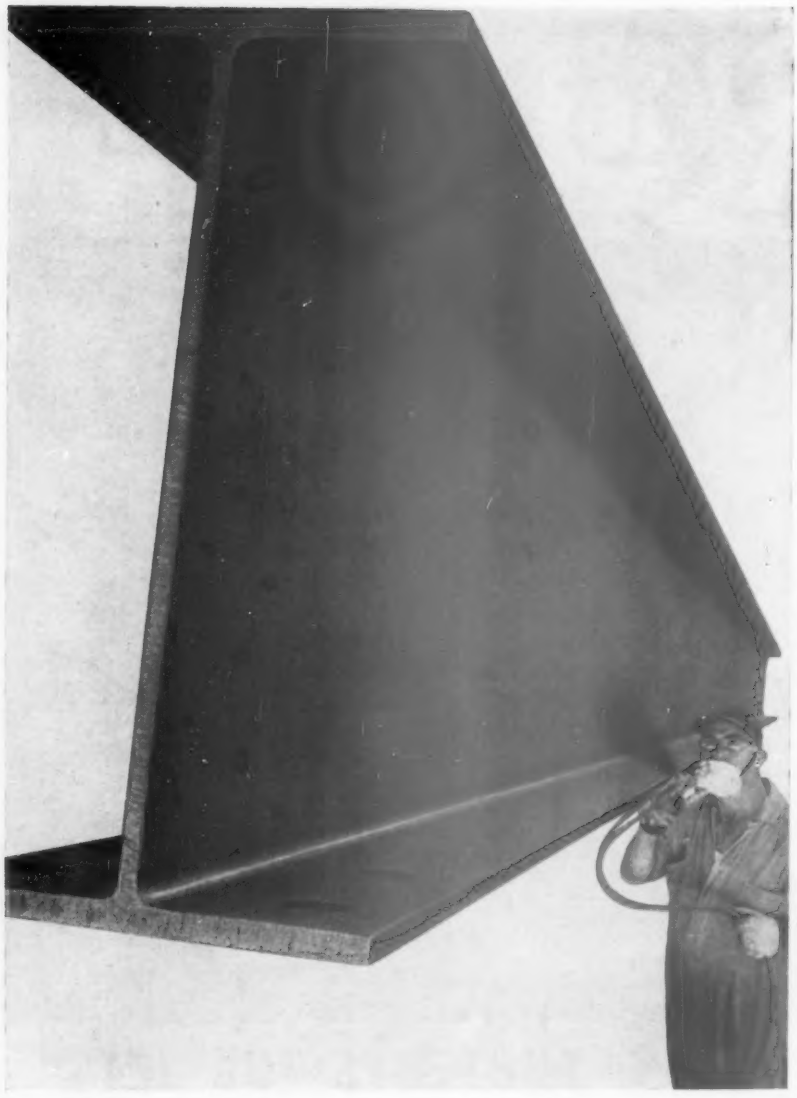

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INORGANIC ZINC COATING is rapidly gaining recognition as the ultimate for basic protection of steel. For example, a large Gulf area chemical plant now under construction specified zinc—both hot-dip galvanizing and Carbo Zinc 11 inorganic zinc coating. Both methods are equal in performance and galvanic protection—the choice is a matter of economics.

HOT-DIP GALVANIZING is generally best for small pieces and irregular shapes: handrails, angles, floor gratings, ladders, etc.

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features a vaportight vessel with built-in low-pressure degassing section, normally requires less than 1 kw. per hour of power, and has a chemical requirement no more than that for conventional treating. Source: **Petrolite Corp., Petreco Div.,** P. O. Box 2546, Houston 1, Tex.

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Meter transmitter and monitor

Where a low-flow-rate sensing device is needed on meters, a new positive-displacement meter monitor may serve the purpose. The monitor, tradenamed the Murd-O-Mac Model 2 PMRC, functions as an adjustable reset time-delay to stop the delivery of fluid through a meter if the flow rate drops below a predetermined rate.

The small modular transmitter can be affixed to the end of a meter register. It is a double-pole, single-throw switch which is actuated once for each barrel of oil registered on the meter. To protect it from malfunction, it is encased in brass and encapsulated in epoxy. A ½-in. conduit hub is provided for external wiring connections.

The monitor operates from 95 to 125-volt a.c. power, single-phase, 60 c.p.s. and requires about 5 watts of power. Monetary power failure will not shut the system down as the monitor is designed to reset when power returns. Source: **Murdock Associates,** P. O. Box 9635, Tulsa, Okla.

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New drilling mud

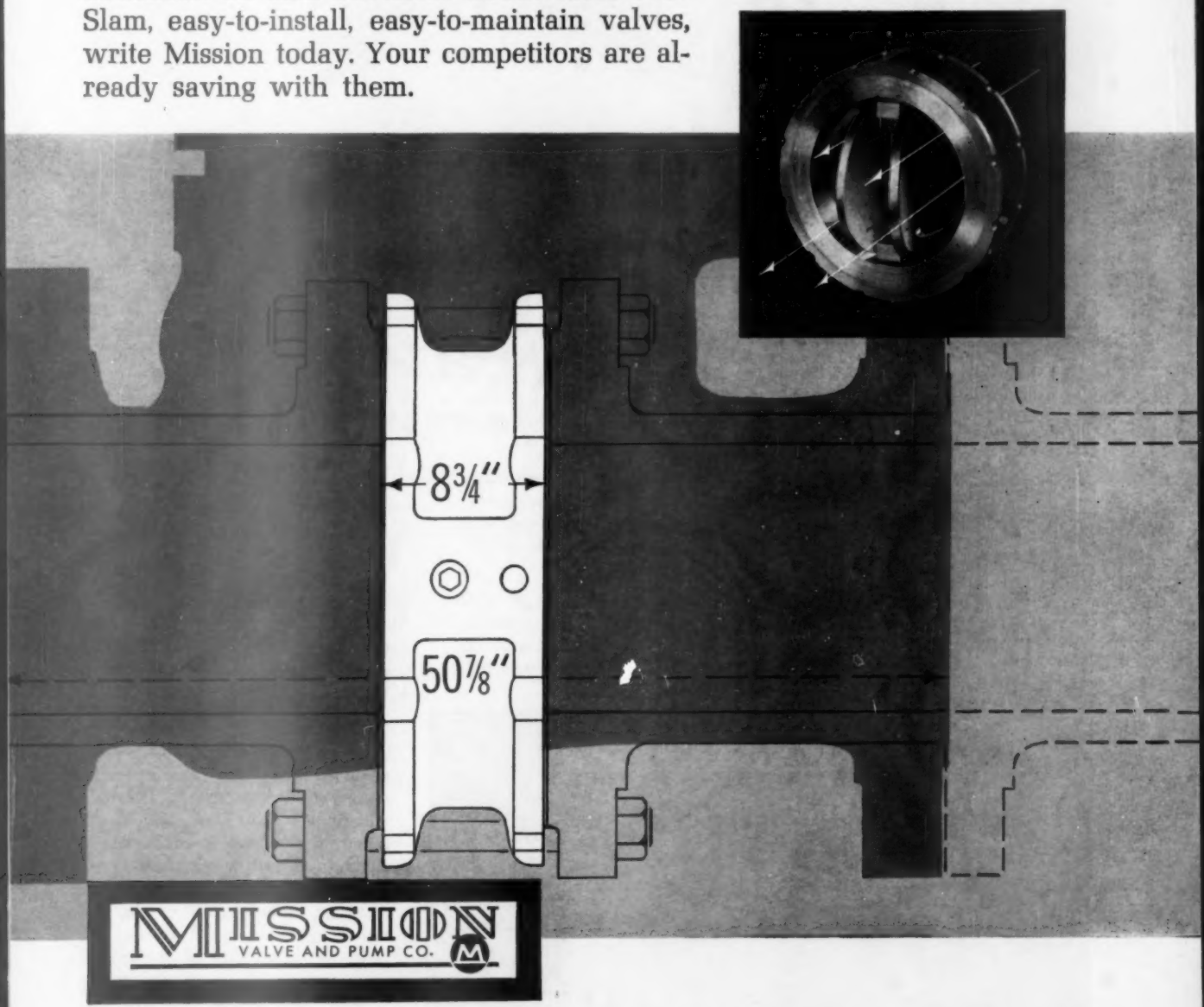
A newly developed experimental drilling fluids system has been developed that combines a material called XP-20 with a chrome lignosulfonate dispersant. The result is a chrome lignite-chrome lignosulfonate mud that is said to be simple to prepare and maintain.

The basic ingredients of the system, called XP-20/Spersene, are water, bentonite, barite, caustic

The illustration compares a 10-inch Duo-Chek Check Valve with a conventional check valve. In one application a 10-inch, Series 2500, Duo-Chek, which meets all ASA strength and design requirements except face-to-face size, is in continuous operation on a reciprocating compressor discharge line. A conventional swing check in this service would weigh over 5,000 pounds. The Duo-Chek weighs 285 pounds.

Here are some more quick facts: Available in sizes from 2 to 48 inches, ASA series 125 through 2500, in steel, stainless, aluminum, and bronze. Corrosion and heat resistant seals available. To find out more about these NO-Slam, easy-to-install, easy-to-maintain valves, write Mission today. Your competitors are already saving with them.

Mission Duo-Chek weighs less than 10% as much



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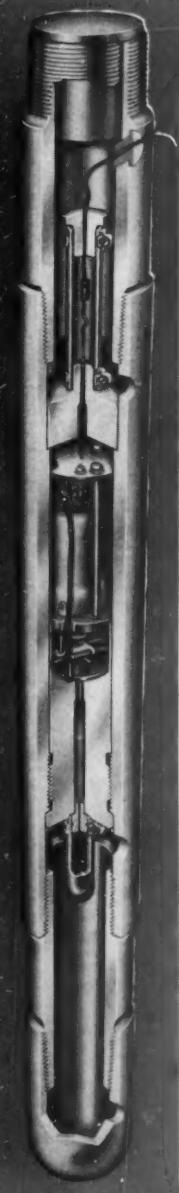

Dependability of Product Ball Brothers' Pressure Sentry MK-7, for pumping, flowing, or shut-in wells, is permanently installed below the pump. Digital signals from a Bourdon tube-coded wheel assembly are sent up a single conductor wire to assure a ± 1% pressure readout accuracy. Readout is not influenced by absolute value of current or resistance of wire. A simple, portable surface unit makes a permanent record of reservoir pressures on chart paper.

Continuous, intermittent, or automatically timed pressure recordings may be made. Available in pressure ranges to 8000 psi. Will operate in wells with temperatures to 275°F.

and Service Simple to install and operate. However, engineering, installation and repair services are always available from Ball Brothers.

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soda, chrome lignite, and chrome lignosulfonate. The mud is reported to be unusually stable under high temperatures and pressures. It is also reported to have outstanding filtration characteristics, retard the natural swelling of drilling solids, and to have excellent tolerance for contaminants. Source: **Magnet Cove Barium Corp.**, P. O. Box 6504, Houston, Tex.

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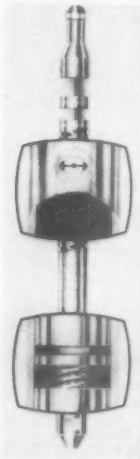
Latest subsurface sampler



Samples of oil, gas, and water can be obtained with this new subsurface sampler which measures 1¼ in. in diameter and either 47 or 66 in. long. By presetting the tripping clock, the operator can obtain samples at the desired location.

The instrument can be purged and sealed before sampling, and the sample can be removed under pressure if necessary. The sampler comes in two sizes: 250 and 500 cc. Source: **Kuster Co.**, P. O. Box 7038, Long Beach 7, Calif.

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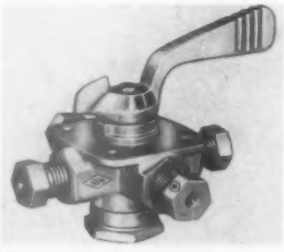
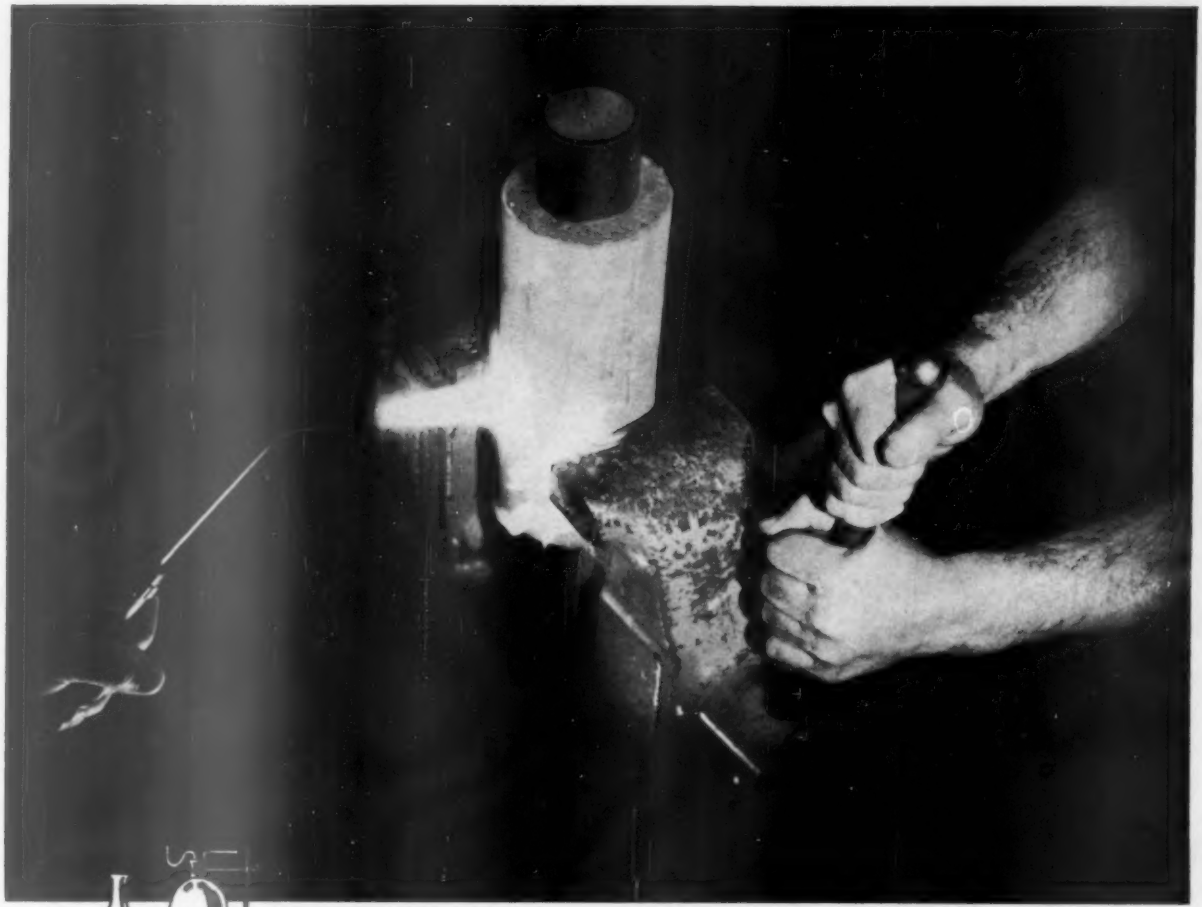
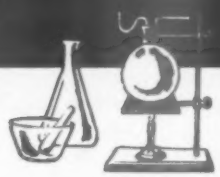


Chromatograph sampling valve

Gas chromatograph users may find this new sampling valve useful as it is designed especially for measuring off and taking samples for analysis by chromatograph. The valve will fit into most fluid-analysis systems where samples of liquids or gases produced or purchased must be analyzed for chemical content. Features include a teflon plug that requires no lubrication, thus eliminating the possibility of contaminating samples with valve lubricants.

Two valve designs are available:





NEW STABILIZER

helps prevent loss of cement strength in hot holes

HALLIBURTON SILICA FLOUR now makes it possible to maintain or improve cement compressive strengths and keep cement permeability *low* in even the hottest wells.

Portland-type cements show drastic strength retrogression when subjected to high temperatures. A cement having a good compressive strength of 4,500 to 5,000 psi may lose *half* this strength in only 14 days exposure to high well temperatures. Silica Flour reacts chemically with the cement to help combat this strength retrogression.

Experience in cementing over 500 hot holes using blends of 20 to 40 per cent Silica Flour with retarded cements has shown impressive results in controlling strength retrogression and undesirable permeability increase. This additive is compatible with all commonly used cements, retarders, low water loss additives, weighting and lost circulation materials.

Lasting protection for your well requires lasting cement strength with low permeability. Investigate Silica Flour, another product development of Halliburton research . . . for cementing *any* well over 200° F. and for secondary recovery wells using steam or thermal drives.

. . . where advanced oil well cementing begins —through research!

CEMENTING SERVICES

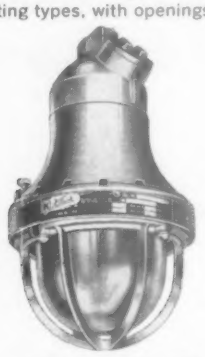
Halliburton
COMPANY • DUNCAN, OKLAHOMA

Killark introduces two new lights for hazardous locations

EXPLOSION-PROOF!

SERIES "E" for Class I areas:
Group A—Acetylene Group B—Hydrogen

Copper-free aluminum castings, various types of steel porcelain enamel reflectors accommodating 150 watt and 200 watt lamp sizes. Available in pendent, ceiling, bracket and concrete mounting types, with openings for ½", ¾" and 1" conduit.



MERCURY VAPOR . . . Cast in copper-free aluminum, with clear globes of either the fluted or prismatic type, or the smooth type. Choose from pendent, ceiling, bracket or flush concrete mounting styles, and a variety of steel porcelain enamel reflectors. Two basic sizes of each mounting arrangement accommodate Mercury Vapor 250 watt and 400 watt sizes.

Where safety counts, you can count on the performance of these skillfully designed and constructed explosion-proof fixtures by Killark. They're available through 27 representatives in the United States and Canada, and warehoused in 18 strategic locations.

6131

Killark

ELECTRIC MANUFACTURING CO.
Vandeventer and Easton Ave. St. Louis 13, Mo.
In Canada: Killark Electric of Canada, Ltd., 421 Islington Ave. South, Toronto 18, Ont.

a four-way and a double four-way design. With the double four-way design, two identical loops may be operated simultaneously with one handle. Port connections are for unflared ⅛-in. tubing, with O-ring compression seal. Maximum working pressure for gas is 50 psi. For liquids, it is 90 psi. Temperature range is from −65° to 250° F. Source: **Republic Mfg. Co.,** 15655 Brookpark Rd., Cleveland 35, Ohio.

•

Two-inch flowmeter for 5,000 psi.

Flow rates in both water-flood operations and in high-pressure petrochemical processes can be measured with a new 2-in. model of the Whirl-Flo flowmeter now on the market rated at 5,000 psi. Using a vortex-velocity principle of measurement, the meter comes in two models: L2S-H for liquids, and G 25-H for gas.

The meter is said to be simple in design and construction as compared with conventional meters, yet highly accurate, easy to install and service.

The meter comes either with 2-in. male pipe-thread connections or with flanges. Source: **Rotron Controls Div., Rotron Mfg. Co., Inc.,** Woodstock, N. Y.

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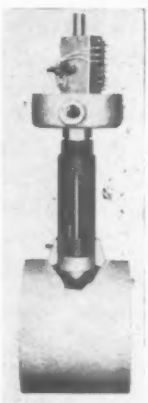
Pump control for product lines



When a solid pig or plug passes a given point in a petroleum-products pipeline, a new instrument will automatically indicate passage and/or start or stop a pump. Called a Pig-Trol, the control has no packings, bellows, or stuffing boxes. Instead, it depends for operation on a magnet-attracting sleeve, raised or lowered by a contoured sensing plunger, which attracts or releases a permanent magnet attached to a

Heavy equipment and large crews are not required. Here, two men and a butt-fusion rig easily join and install large diameter pipe made of MARLEX.

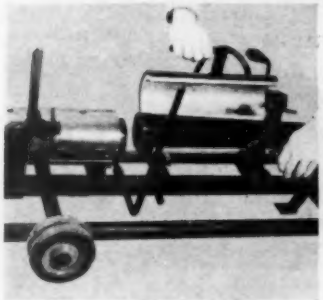
"Plastic pipe made of MARLEX* costs less to install . . . won't corrode . . . promises exceptional service"

Russell Lasater, President of Lasater Construction Company, Odessa, Texas, is sure that high density plastic pipe will soon be used for a great many oil and gas field applications. "We have installed some 50 miles of pipe made of MARLEX for gas gathering and salt water disposal in the last year and a half," he reports . . . "to the complete satisfaction of all concerned. Its initial cost is low . . . installation very economical . . . and, because it does not corrode, its service life should be exceptional." Mr. Lasater adds, "We can install lightweight MARLEX pipe at a faster rate than steel—using fewer men and without hoists or side-boom cats. Also, butt-fusion joining costs about 75% less than welding."

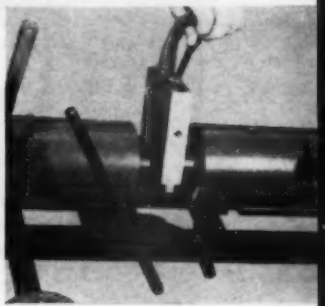
Today, coilable and straight lengths of pipe made from MARLEX TR-212 (ASTM Type III polyethylene) are enjoying ever wider use for gas distribution, gas and crude gathering, salt water disposal, water supply lines and the like. MARLEX pipe is tough, durable, and easy to install. It has good load bearing characteristics, a wide usable temperature range, and is virtually indestructible . . . resists acids, solvents, alkalies, bacteria, rot and fungi.

*MARLEX is a trademark for Phillips family of olefin polymers.

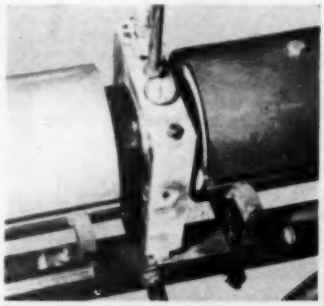
Low-Cost Butt-Fusion Makes Strong Joints Quickly and Simply!



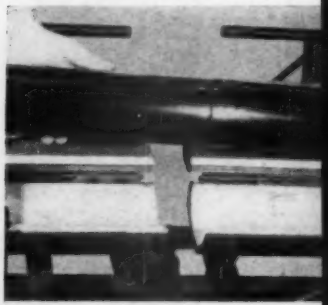
(1) Pipe is clamped in portable fusion rig.



(2) Thermostatically controlled heating plate is inserted.



(3) Ends to be joined are heated in a matter of seconds.



(4) No waiting . . . joint is even stronger than pipe.

For more information, see your pipe supplier . . . or contact us.

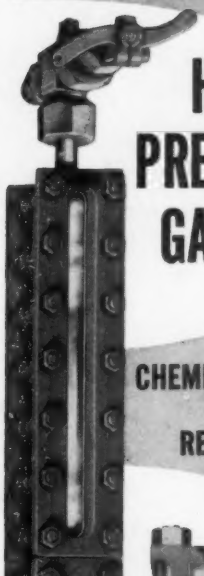
PHILLIPS CHEMICAL COMPANY

Bartlesville, Oklahoma

A subsidiary of Phillips Petroleum Company

PHILLIPS 66 MARLEX PLASTICS

Strahman



HIGH PRESSURE GAUGES

FOR CHEMICAL PLANTS AND REFINERIES

THRU VISION

REFLEX
Single or Multiple Sections

Multiple section gauges are made with a one piece body chamber. This method of construction, originated by Strahman, has become generally adopted as standard by most gauge manufacturers.

An added safety feature! Except for visibility slot, glass is completely enclosed.

- Explosion proof illuminators
- Heated or cooled gauges
- Large Chamber Gauges
- Frost-proof extensions
- Tubular Gauges
- Gauge Cocks

P1-010

STRAHMAN VALVES INC.
NICOLET AVE., FLORHAM PARK, N. J.

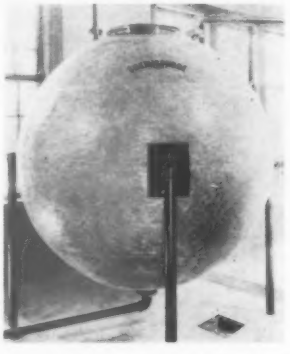
mercury or pneumatic switch.

Hermetically sealed switches are used to maximize reliability. Two switches are provided with the control so the system can have isolated separate circuits for pump operation and for the telemetering circuits. An extension neck is provided on the unit so the control head of the control is mounted above grade, even though the product line is buried several feet.

The control is designed to work equally well on spools, spheres, and mechanical or knife-type scrapers. The sensing plunger indicates passage of the pig without damage to its surface. Source: **Magnetrol, Inc.,** 5300 Belmont Rd., Downers Grove, Ill.

Spherical reinforced-plastic tank

STORAGE capacities of 847 and 2,009 gal. are provided by this corrosion-resistant tank made of glass-reinforced polyester material. Called a Chemisphere, the maker recommends it for use as a processing or storage vessel for materials which require a tank with high resistance to chemicals.



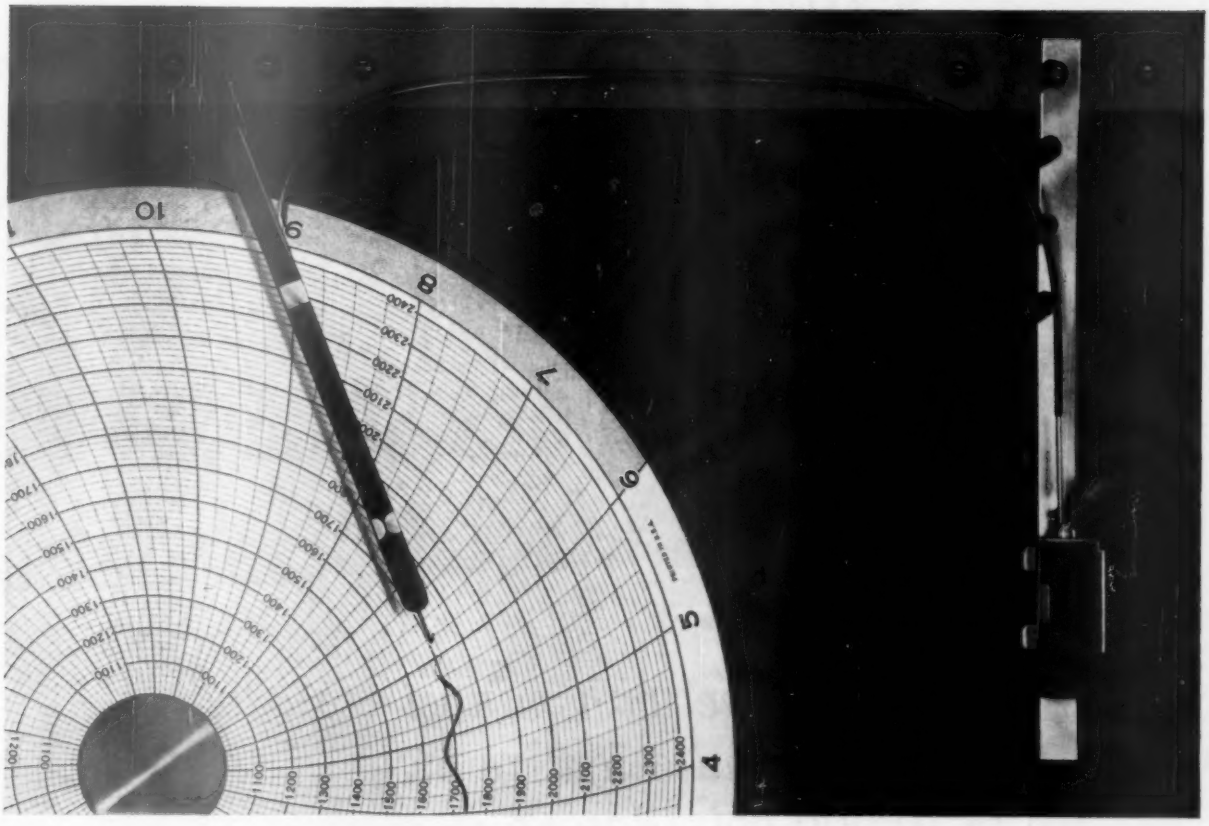
Made in diameters of 6 and 8 ft., the vessel weighs about one-seventh that of a stainless-steel vessel. It is fabricated through a process of winding continuous fibers impregnated with polyester resin on a spherical surface. The spherical shape provides a minimum surface area per unit of volume and minimum stress concentrations. Source: **Justin Enterprises, Inc.,** 3755 Edwards Rd., Cincinnati 9, Ohio.

Tractor shovel handles 1¾ yd.

OPERATORS of a new tractor shovel will find two features particularly helpful: full hydraulic power steering and oil-cooled power brakes. The RD-7G shovel is powered by a 100-hp. turbocharged diesel engine.

Other features include torque-converter drive, a single-lever power-shift transmission, and a ground-speed-control governor that allows the operator to preset any working travel speed to match the job conditions.

If the operator desires to operate the tractor at a speed of 2 m.p.h., the governor keeps the tractor moving at that speed with or without load, up to the full power of the engine. Source: **Allis-Chalmers Mfg. Co., Construction Machinery Div.,** 864 S. 70th, Milwaukee 1, Wis.



Esterbrook®

NEW MARK-TROL*

eliminates 95% of the mess and maintenance of round chart recorder inking systems . . .

In 10 minutes, convert present markers with Mark-Trol, a completely sealed capillary system with replaceable ink cartridge . . . adaptable to 90% of all round chart recorders in service today.

Esterbrook's Mark-Trol is a completely new concept in marking systems. Because of its universal design, you can eliminate the messy problems inherent in most round chart inking systems in use today. Because maintenance is reduced to little more than routine inspection, Mark-Trol will pay for itself in a matter of days.

Sealed system eliminates dust, dirt, moisture and mold which clogs open-bucket devices. Operation is thoroughly efficient regardless of location, inside or out, under service conditions of humidity, precipitation, chemical fumes or other foreign matter, and over a wider temperature range —0°F to 145°F. Slip-in, disposable, sealed ink cartridge means ink is never directly handled . . . no messy suction tubes, syringes, droppers; no reservoirs to clean out. Eliminates breakage of plastic bags or glass devices. The cartridge contains a large supply of ink, extending your change cycle from days to months . . . and then in a matter of seconds the cartridge is replaced.

ORDER ONE FOR TRIAL—Mark-Trol has been field-tested for 2½ years—extensively in the power and processing fields. We invite you, however, to make a trial installation of your own with a Mark-Trol unit. Send us the coupon today.

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Please send us..... Mark-Trol Conversion Kits at $12.00 each.

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Please also send literature completely describing Mark-Trol. □

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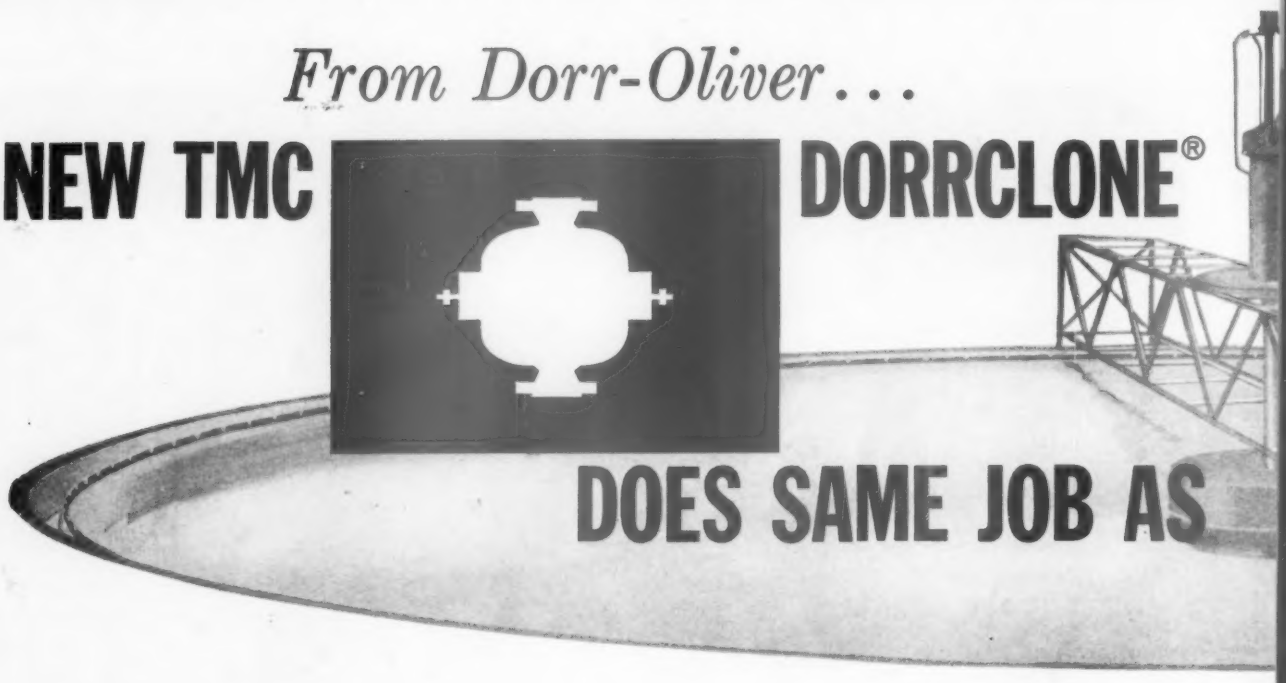
MARK-TROL **THE ESTERBROOK PEN COMPANY** • Technical Products and Instruments Division

From Dorr-Oliver...

NEW TMC DORRCLONE®



DOES SAME JOB AS

TMC DorrClone with midget manifolded cyclones handles entire bottom stream... up to 10,000 bbls/day in new or existing installations... can pay for itself in a month!

The TMC DorrClone is a major new tool for refinery processing. Initial installations prove beyond question that it offers sensational opportunities for important cost savings.

The specific advantages of the TMC DorrClone, compared with thickeners or cone bottom settlers, are numerous and substantial. Briefly –

1. **You save valuable space** . . . When a 3 foot TMC DorrClone occupies only about 7 square feet, there is little reason to tie up more than 1250 square feet with a thickener 40 feet in diameter.
2. **You can raise the capacity of most crackers materially** . . . The TMC DorrClone concentrates solids to 45-50%, compared with the normal 10%. This reduces the amount of cracked oil recycled, and thereby reduces carbon formation.
3. **You save directly on catalyst cost** . . . for the TMC DorrClone eliminates up to 99.5% of the fine particle carryover commonly contained in the thickener (or decanter) effluent. Reclaimed catalyst can be returned to the reactor.
4. **You work under conditions of greater safety** with the TMC DorrClone . . . Construction is completely closed. There are no spills, no boil-overs, no danger of fire or explosion.
5. **You save on maintenance** . . . because you largely eliminate the need to dig out settled solids in the fuel oil tank.

Whether you are planning to replace your present thickeners or cone bottom settlers, or are equipping new FCC units . . . investigate. Let refinery-experienced Dorr-Oliver engineers help you evaluate the TMC DorrClone for your operation.

Look into the savings you can make. Write to Dorr-Oliver Incorporated, Stamford, Connecticut.

DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

3 FT. DIA.!

THICKENER 40 FT. DIA.!

The TMC DorrClone is designed around compact, long-life, midget aluminum oxide cyclones, manifolded in groups in parallel. In this exploded view, a number of the cyclones have been removed to permit a clearer view. Inserted blanks can adjust capacity. All cyclones operate alike, and each clarifies approximately 30 bbls/day. Clarified oil under high centrifugal force swirls to the center of each cyclone, flows up and out. Solids flow helically down the tapered side of the interior and out. Particles are classified at approximately 5 microns.

SPECIFICATIONS	TMC-60	TMC-180	TMC-300
Capacity, bbls/day	1000-2000	4000-6000	7000-10000
Height, inches	17	24	30
Diameter, inches	22	32	40
Weight, lbs. (approx.)	1100	1800	3000
Pressure, psig	150	150	150
Temperature, °F.	850	850	850

TO: DORR-OLIVER INCORPORATED
STAMFORD, CONNECTICUT

Attn.: Mr. O. W. Johnson

☐ Please send me more information on the TMC DorrClone.

☐ Please have sales representative call.

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

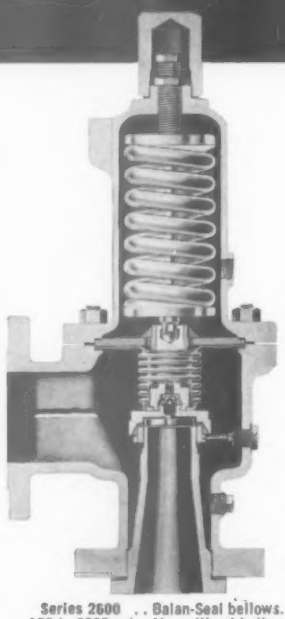
value...

the reason FARRIS OUTSELLS all others

Farris Process Safety-Relief valves have unique design features which provide product serviceability and dependability unmatched by *any* competitive valve. True value is "built into" Farris valves.

- **2½ to 1 ratio—guide length to guide diameter—prevents galling and hanging up.**
- **High thermal expansion of sleeve guide and low thermal expansion of hardened stem retainer stops binding at high temperatures.**
- **Hardened stainless steel optically lapped disc . . . self aligning for maximum tightness.**
- **Elimination of effects of back pressure by "BALAN-SEAL" bellows permits use of smaller discharge piping . . . Saves up to 15 times the cost of the valves . . . isolates internal working parts from lading fluid.**
- **Industry's most complete line. Available in cast iron, steel and special materials. Sizes ½" to 8". Pressures to 10,000 psig. Temperatures to 900°F. Enclosed or exposed springs. Plain, open lever or packed lever construction.**

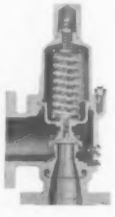
All Farris Nozzle Valves Conform To ASME Power Boiler Code, Section 1, and The ASME Unfired Pressure Vessel Code, Section 8.



Series 2600 . . Balan-Seal bellows. 150 to 6000 psig. Also without bellows.

Series 2740 & 2741 . . . simple, rugged cast steel design. Pressures to 5000 psig @ 750°F.

Series 2745 . . . Durable, compact, high pressure nozzle valve. Internal parts 316 stainless steel. Pressures to 10,000 psig.



Series 2950 . . . Cast iron valve similar to Series 2600. Max. pressure 250 psig. @ 450°F, 400 psig. @ 150°F.

Write for FREE Catalog FE-118

GET FULL VALUE: Replace With Farris... Complete Interchangeability With Standardized Face To Face Dimensions.

Farris® **ENGINEERING CORP.**

527 COMMERCIAL AVENUE
PALISADES PARK, NEW JERSEY

AFFILIATES: Farris Combustion Controls Corp. • Farris Flexible Valve Corp. • Farris Universal Machine Corp. Farris Industries Canada Ltd. • Farris Engineering Ltd., London, England

TRADE LITERATURE

Generalized control theory

Booklet TM-8 explains with text and examples the basic theories in automatic fluid control. The 12-page technical manual is intended as either a primer for those embarking on a rigorous study of control theory, or to provide a background for those seeking only a general knowledge of the analytical approach to control dynamics. Source: **Fisher Governor Co.,** Box 307, Marshalltown, Iowa.

Boiler feed-water treatment

This new, 24-page booklet entitled "An Introduction to Boiler Feed-water Treatment" answers such common questions as: How pure must feed water be? How does operating pressure influence boiler water composition requirements? What is meant by "external" and "internal" feed-water treatment? and many more. Source: **Nalco Chemical Co.,** 6216 W. 66th Pl., Chicago 38, Ill.

Control-valve catalog

Eight-page Catalog DCV-1 shows control valves from ¼ to 6-in. sizes, available in ductile iron, cast iron, cast steel, stainless steel, bronze, monel, and aluminum. Included are pressure and temperature ratings, features, capacity charts, names of parts, dimensions, a flow chart, diagrams of various hookups, and sample specifications. The publication also offers information on when to use a controller and when to use a positioner. Source: **OPW-Jordan Corp.,** 6013 Wiehe Rd., Cincinnati 37, Ohio.

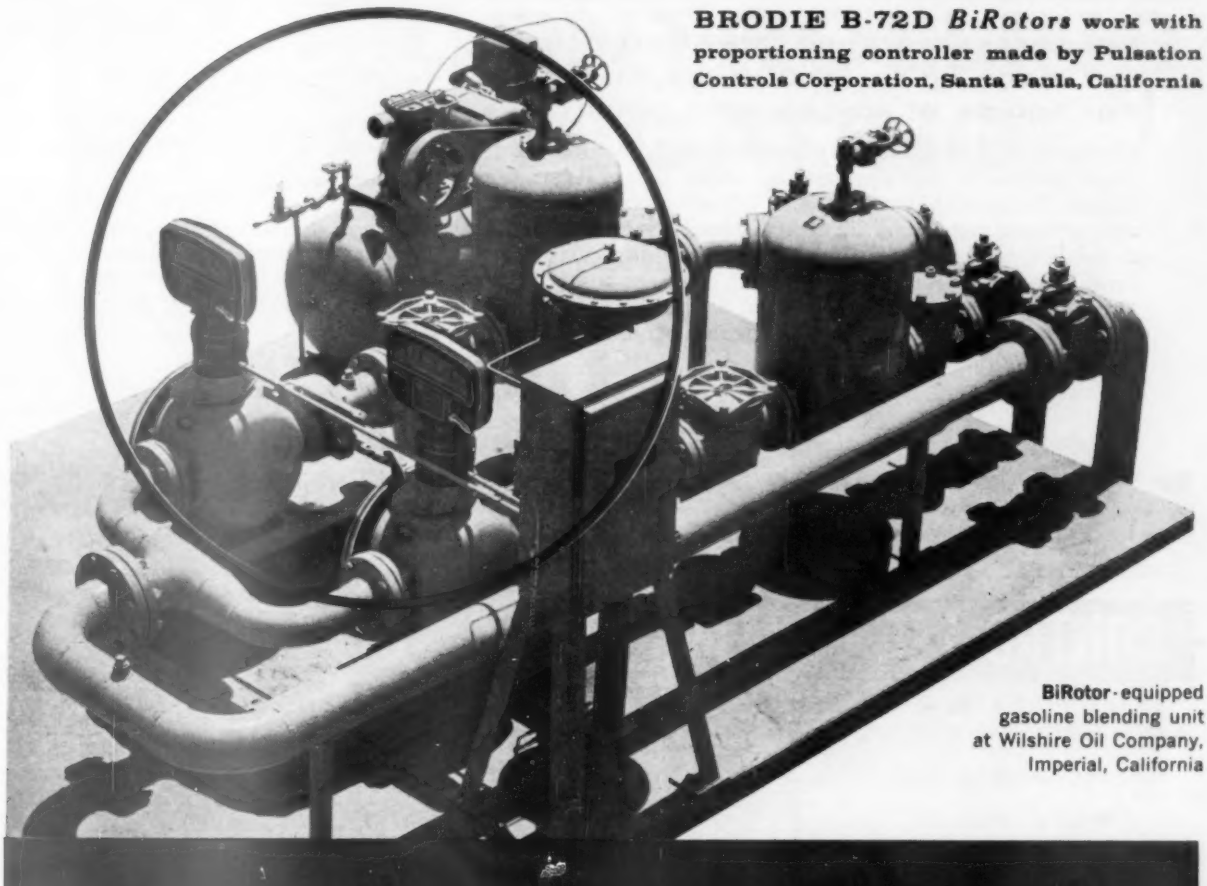
Heat transfer hardens wear areas

Spin/Hard heat treatment of sprockets, gears, traction wheels, rollers, and other products requiring hardened areas for high wear resistance is the subject of new four-page Folder 2922, just released. It notes that the heat treatment produces a minimum hardness of 55 Rockwell C, ⅜ to ½-in. deep, on iron and steel castings and fabricated components from 8 to 42-in. in diam-

BRODIE *BiRotors*

HELP BLEND GASOLINE DIRECTLY INTO TANK TRUCKS

BRODIE B-72D *BiRotors* work with proportioning controller made by Pulsation Controls Corporation, Santa Paula, California



BiRotor-equipped gasoline blending unit at Wilshire Oil Company, Imperial, California

With many service stations handling at least three gasoline grades, the tankage required for day-to-day supply may be a problem. Refineries and bulk plants often blend the required gasoline directly into tank trucks.

This compact gasoline blending unit, equipped with two B-72D **BiRotors**, two Brodie strainers and air eliminators, feeds output into proportioner to control rate of flow. **BiRotor** meters are noted for their "blend" of high accuracy and low maintenance. Check BRODIE today!

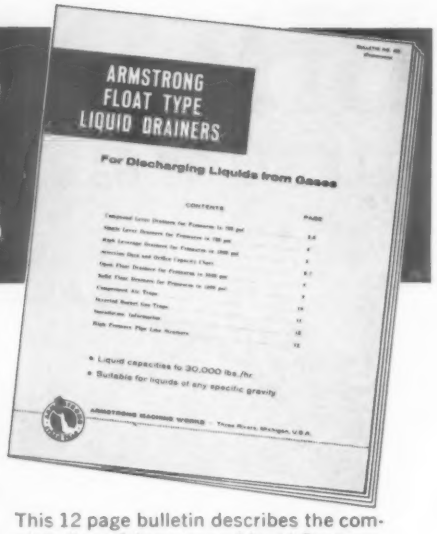
BRODIE

METERS · VALVES

RALPH E. BRODIE COMPANY

REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

REMOVE LIQUIDS FROM GAS UNDER PRESSURE with ARMSTRONG LIQUID DRAINERS



For pressures from 1 to 5500 psig
For loads up to 30,000 lbs./hr.
For liquids of any specific gravity

If you must remove water or liquid hydrocarbons from gas under pressure, the chances are there is an Armstrong Liquid Drainer that can do the job effectively, efficiently and without gas loss. The Armstrong line of drainers, developed especially for the oil and gas industry, is extensive. It ranges from small ball float drainers to high pressure units with open floats or solid floats.

For help in solving your particular problems, send an outline of your needs.

This 12 page bulletin describes the complete line of Armstrong Liquid Drainers. It gives detailed information on how to select the right drainer for your requirements, capacity and pressure data, specifications and prices. Ask for your copy today.

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Made by the makers of Armstrong Steam Traps

ARMSTRONG MACHINE WORKS

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Weight
Pump Pressure
Torque
Penetration
Rotary Speed
Pump Speed

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NEW! EDITORIAL FILE CASE

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P. O. Box 1260 • Tulsa 1, Oklahoma

eter. The treatment hardens wearing areas only and allows remainder of component to retain its machinability. Spin/Hard components are used extensively on bucket elevators, conveyors, and many types of drive and conveyor chain. Source: **Link-Belt Co.,** Prudential Plaza, Chicago 1, Ill.

1,000-watt mercury vapor floodlight

Yours for the asking, Bulletin MF-261 introduces the new Mercflood floodlight, designed to take full advantage of long life and efficiency of mercury vapor lamps. According to the literature piece, the floodlight delivers 2½ to 3 times more light than a general-service filament lamp of the same wattage. Rated life is about 7,000 hours, approximately 3 years' life in the average in-plant installation. Source: **Appleton Electric Co.,** 1701-1759 Wellington Ave., Chicago 13, Ill.

Cements resist corrosion attacks

Six corrosionproof cements, reviewed in a 12-page bulletin now being offered free, are based on epoxy, furan, phenolic, and polyester resins and sulfur and silicate materials. Tables give detailed physical properties and estimating factors for various types of corrosion-proof masonry construction. Bulletin 5-1 features a chart giving corrosion resistance of the six cements to 166 common corrosives. Source: **Atlas Mineral Products Co.,** Mertztown, Pa.

Process-control systems

A technical brochure describing automatic process-control systems for pipelines, petroleum processing, and production is now available. In six pages, it describes characteristics of the systems and gives typical system specifications. Data-transmission techniques, display techniques, and data-cooling techniques are also described. Source: **Electrodynamics Instrument Corp.,** 1841 Oil Spanish Trail, Houston 25, Tex.

Newest insulation system

The metal-on insulation system, an integrated pipe insulation that combines metal jacketing, high-tem-

HOWELL INSTRUMENTS, INC.

MILLI-V-METER—*The Instrument with the Tape-Slidewire—for...*

WARNING RECORDING CONTROLLING INDICATING

Direct and/or Remote
DIGITAL READOUT
ACCURATE TO
0.1%
for all functions of industrial processing plants... 1/20th cubic foot of dynamic measurement.

HOWELL temperature indicator to monitor 48 sensing locations through selector switch circuitry.

For TEMPERATURE, FREQUENCY, FLOW, LEVEL, PRESSURE, R.P.M., WEIGHT, etc.

The most comprehensive service is derived through coupling the Milli-V-Meter with warning lights, horns, controlling relays, recorders, computers, remote digital displays *...applications limited only by the imagination or ingenuity of the engineer!* The virtue of high accuracy measurement is thus the means of maintaining and improving the quality of products, the elimination of waste or loss, and the saving of time.

QUALITIES

1) Accuracy 1 part in 1000. Laboratory precision for industry or the military.
2) Compatibility with any transducer—AC or DC.
3) For strain gage, linear differential transformer, thermocouple, thermistor, resistance thermometer, pulse or variable frequency circuits or systems.
4) Operates directly from 60- or 400-cycle power as specified.

Full information is available for the asking!

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ATLANTA, GA.; CHICAGO, ILL.; COMPTON, CAL.; CLEVELAND, DAYTON, OHIO; DENVER, COLO.; HOUSTON, TEX.; SEATTLE, WASH.; VALLEY STREAM, L. I., N. Y.; WICHITA, KAN.; TORONTO, ONT. (George Kolk Ltd.); MITCHAM, SURREY, ENGLAND (Bryans Aeroequipment Ltd.)

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It's FIRST with me...

I like personal attention

The most important person at the First City National Bank is *you*. Everything in our new bank was designed to prove it.

Look—no doors . . . no gates . . . no "don't-enter-without-an-appointment" private offices.

Instead—a beautiful, open banking room where every officer is within hand-shaking distance. Where interested, personal attention makes you feel welcome.

Drop in and see for yourself how pleasant it is to bank in the friendly, informal atmosphere of First City National Bank. It takes only a minute to open an account. Why not join the "First family" of Houston this week. We'll be expecting you.

the new

FIRST CITY NATIONAL BANK *of houston*

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

perature calcium-silicate insulation, and moisture barrier in one factory-fabricated unit, is described in new Brochure IN-217A. It illustrates the system, tells how it is installed in a single, cost-cutting operation, and enumerates its advantages. Specific installations, both indoor and outdoor, are included. Source: **Johns-Manville,** 22 E. 40th St., New York 16, N. Y.

Closed-circuit-TV system

New technical data sheet 2604 is now available covering the all-weather closed-circuit Hawk 401 television system. The literature points out that the system's weather-proof cabinet eliminates any requirement for additional environmental protection even under unreasonable operating conditions. An exposed roof-top camera installation clearly shows activity inside a plant truck loading area across more than 500 ft. of brilliantly sunlit plant yard. At night, the same camera takes up guard duties over a plant exit door illuminated by a single shaded 100-watt light bulb. Source: **Diamond Electronics, Diamond Power Specialty Corp.,** Box 415, Lancaster, Ohio.

Spirally grooved drill collar

Featured in a new four-page folder, the drill collar is specifically designed to overcome problems of differential pressure sticking the drill-collar string in the hole. The publication shows numerous advantages of the tool, its operation, recommendations for its general use, and prices—including rental and use of the process machined on customers' own drill collars. Source: **McClinton Tool Co.,** 8603 Glenaire, Houston 17, Tex.

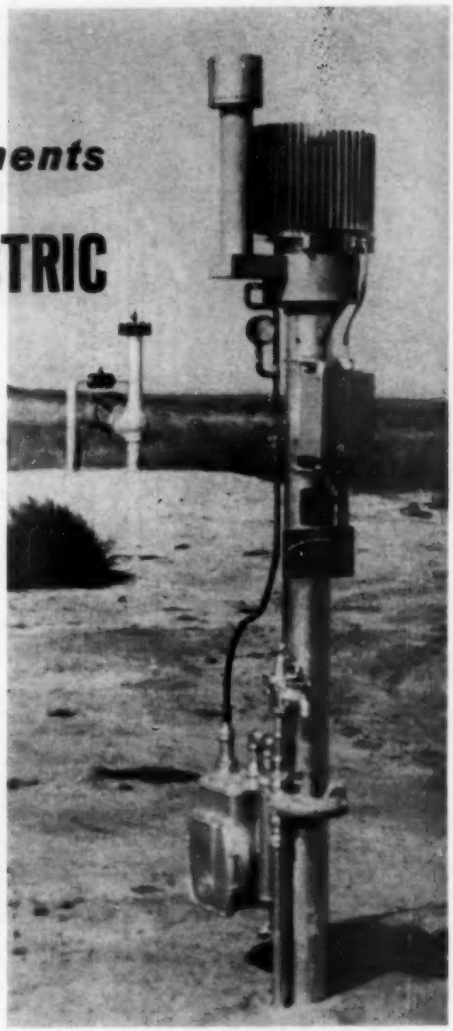
Industrial grease

This 32-page booklet covers in a concise, easy-to-read summary the basic principles, properties, types, and rules for choice and application of lubricating grease. It includes the effect of additives on the properties of grease. The booklet provides separate chapters on the nature of grease, types, applications, and multipurpose grease. Source: **Bardahl Mfg. Corp.,** 1400 N.W. 52nd St., Seattle 7, Wash.

Texas Instruments

THERMOELECTRIC POWER GENERATOR

. . . Proved in Hugoton Field



In the Hugoton Field, near Ulysses, Kansas, a Texas Instruments 8-watt Thermoelectric Generator, installed by Cathodic Protection Service of Houston, is being used to protect well casing from electrolytic corrosion. In this area, where the cost of bringing in commercial power to each well would be prohibitive, well gas is used as the fuel . . . heat is converted directly to electric power by the Thermoelectric Generator. Since its installation earlier this year, capacity of the unit has consistently exceeded the current required.

Texas Instruments Thermoelectric Generators provide an economical, maintenance-free power source for operating unattended, remotely located equipment such as automatic controls, telemetry equipment, cathodic protection, and emergency power. Long-term reliability is assured by the rugged construction and simplicity of the "no-moving-parts" design. Operation is not impaired by full exposure to the elements . . . winds up to 100 mph have not interrupted test operations.

Write for complete information.

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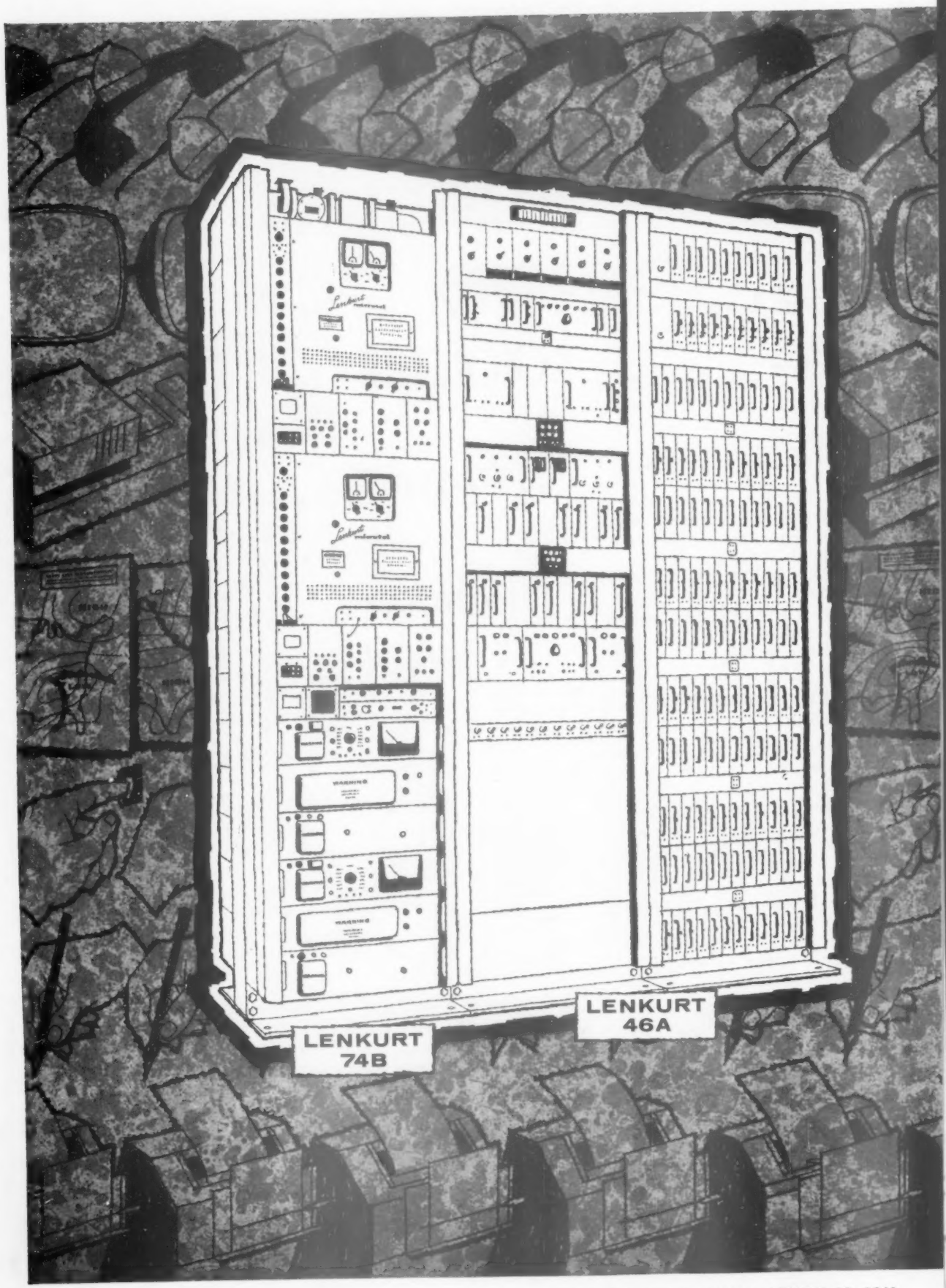
LENKURT
74B
LENKURT
46A

AUTOMATION THROUGH COMMUNICATIONS

New Microwave and Carrier from Lenkurt Electric

With the development of 46A Carrier and 74B Microwave, Lenkurt Electric now offers the most complete line of Microwave & Carrier available to pipeline communication engineers.

Offering such advantages as high channel capacity, excellent data loading, and operating economy, these systems are specifically designed to solve pipeline communications problems. The 74B and 46A are most efficient where you need a highly reliable, economical method of transmitting heavy channel cross sections of voice or broadband data.

The 46A, which is expandable to 600 channels, uses solid-state devices throughout, and is the result of many years' research and development by Lenkurt Electric. It has been engineered to meet the exacting requirements of high data loading, high-density voice communications, and CCITT specifications.

The 74B Hot-Standby Microwave offers you more advantages than any other microwave system in existence. The most economical equipment of its type, it is also the most reliable. An intelligent combination of solid-state devices, advanced circuit techniques, and proven design features make the 74B a truly unique system. Added advantages, such as in-service testing and many maintenance features, make the 74B a custom-engineered system for pipeline communications applications.

For detailed information on the 46A and 74B, complete the coupon below and mail to: Department 216, Lenkurt Electric Co., Inc., San Carlos, California.

Lenkurt Electric Co., Inc., San Carlos, California. Regional Offices in Atlanta, Chicago, Dallas, Minneapolis, New York, and San Carlos.

Department 216
Lenkurt Electric Co., Inc.
San Carlos, California

Please send literature on:

☐ Lenkurt 76B Microwave ☐ Lenkurt 46A Carrier

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Subsidiary of

GENERAL TELEPHONE & ELECTRONICS

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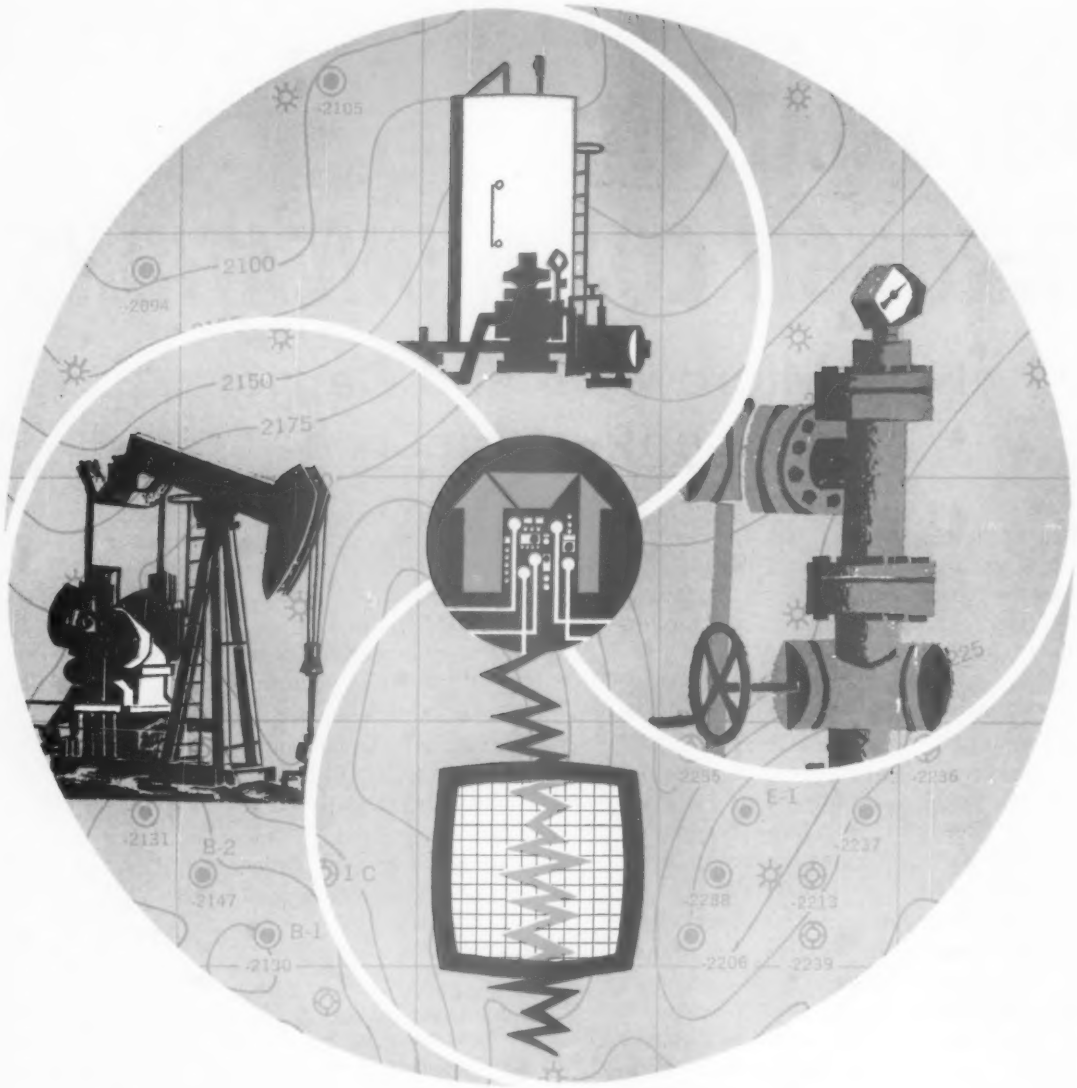

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AUTOMATIC CONTROL SYSTEMS FOR PETROLEUM PRODUCTION

Now, with PARACS* you can cut production costs to the bone... You can take advantage of lease consolidation... You can have a system designed to meet the characteristics of a single lease or multiple leases... You can benefit from the experience background of over 40 automated oil field leases... You can get all the advantages of total capability with single source responsibility. Bulletin 12-31 has the facts about PARACS—send for your copy today.

*PARSONS AUTOMATIC CONTROL SYSTEMS

PARSONS Electronics

THE RALPH M. PARSONS COMPANY

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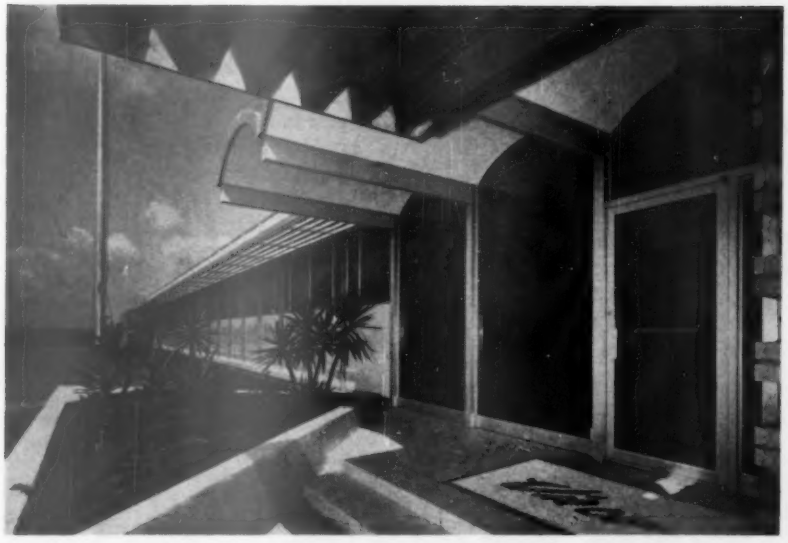
EQUIPMENT MEN



VISCO PRODUCTS CO., producer of chemicals for the oil industry, recently opened this new office and laboratory at Sugar Land, Tex., 20 miles southwest of Houston. Oil-industry guests and business leaders attending the formal opening were given guided tours of the facilities. The $750,000 office and laboratory building contains 25,000 sq. ft. of floor space, nearly 14,000 of which is devoted to the laboratory. Special lab facilities are available for emulsion breakers, water treating, corrosion, and scale.

Louisiana Oilfield Rentals formed to serve Gulf Coast

Louisiana Oilfield Rentals, a new service company specializing in welded-blade stabilizers and string reamers, has been organized to serve the Gulf Coast area. The announcement was made by company president W. R. (Bill) Angelle, Jr., at the firm's headquarters in Lafayette. The company has established a branch office in Houston and a stock point at Harvey, La., to provide service to Louisiana, South Texas, and Mississippi. Angelle was with three producers and later was a partner in a directional-drilling company before organizing the new firm.

Thompson Ramo Wooldridge appoints Robert J. Nelson

As district manager, eastern region, for TRW Computers Co., a division of Thompson Ramo Wooldridge, Inc., Nelson will be assigned to regional headquarters in New York City. Prior to joining TRW, Nelson was with Information Systems, Inc., and for 14 years before that he specialized in the application and sale of electrical and mechanical equipment for Westinghouse Electric Corp. in New York.

Albert W. Rouse is selected for new A. O. Smith position

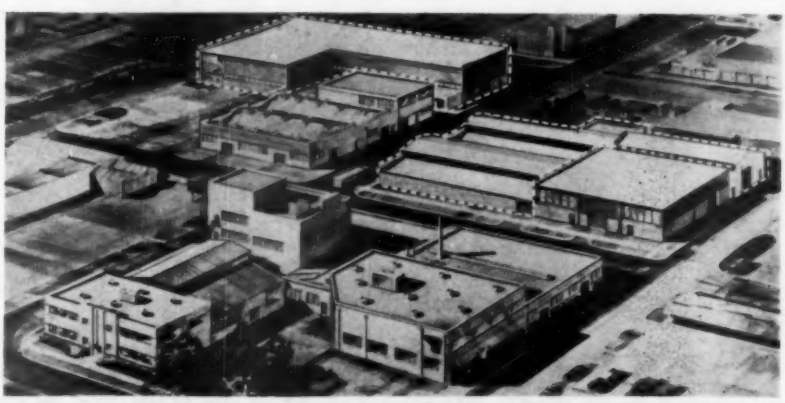
Albert W. Rouse has been named as product manager for fluid-measuring equipment by A. O. Smith International, S.A., export subsidiary of A. O. Smith Corp., Milwaukee. Included in fluid-measuring equipment are petroleum meters, filling-station pumps, liquid hydrocarbon filters, fluid-handling-automation equipment, tank-truck safety devices, and meters.

Before joining AOSSA, Rouse was located in A. O. Smith's Houston office where he specialized in the petrochemical and oil industries.

G & J Weir, Ltd., is appointed licensee by Dresser Industries

The appointment of G & J Weir, Ltd., of Glasgow, Scotland, as a licensee, was announced by Elmer J. Weis, executive vice president of Pacific Pumps, Inc., a division of Dresser Industries. The license and technical assistance agreement negotiated through Dresser, A. G., international representative of Dresser Industries, calls for Weir to manufacture and market centrifugal-pump products of Pacific Pumps, Inc., design.

The new affiliation will be known as Weir-Pacific Pumps, with sales offices based in London, Glasgow, and other key industrial centers throughout the United Kingdom.



$650,000 PLANT-EXPANSION PROGRAM of F. H. Maloney Co. will add about 48,000 sq. ft., in two buildings, to the company's Houston facilities. The buildings will house a production line for meter provers and launchers and will permit the expansion of departments engaged in plastics, metal, and rubber product manufacturing.

Beacon Supply Co. involved in a series of changes

R. W. Sidwell, vice president and general manager of the Pampa, Tex. supply company, announced that Beacon has been named sales and service distributor for compressors, engines, and pumps manufactured by Ajax Iron Works, Corry, Pa. At the same time, Beacon was appointed distributor for triplex plunger pumps made by National Supply, Pittsburgh.

Sidwell also announced the opening of Beacon Supply's sixth store at Lovington, N. M. This move involved a series of personnel changes. B. B. Phillips was promoted from store manager at Farmington to district manager at Odessa.

Dale Shackelford, former field sales at Odessa, was promoted to store manager at Farmington, replacing Phillips. M. B. Allen, former field salesman at Borger, was made store manager at Lovington. Sherman Hunt was transferred from the Odessa store to the Lovington store as pump repairman.

Security Engineering Division makes three new appointments

M. L. Ekas,III

Alfred Thomas

L. G. Jones

Newly named in Security's international division are Miller L. Ekas, III, special export representative in New York City; Alfred Thomas, Middle East representative stationed at Beirut, Lebanon; and Lloyd G. Jones, far eastern representative with temporary headquarters in Bangkok, Thailand.

Security, one of the Dresser industries, is a supplier of drilling bits for the world's petroleum industry. The company has international facilities and is based in Dallas.

Ekas worked for an international oil company before joining Security. Thomas, a veteran of 25 years in the oil industry, will represent Security in all drilling areas of the Middle East and Africa. Jones' new responsibilities include all active free areas east of Iran to the International Date Line, south to New Zealand, and north to Japan.

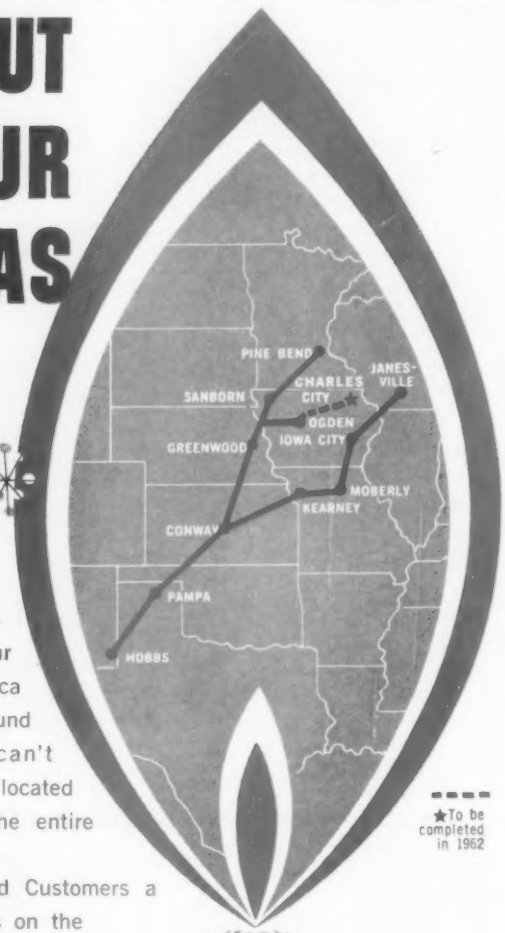
British firm named agent by Mud Control Labs, Inc.

Mud Control Laboratories, Inc., of Oklahoma City, announces the appointment of Production Chemicals (Rochdale), Ltd., of Manchester, England, as territorial agent. The British firm will distribute Mud Control Labs' specialty products for the drilling industry on the continent, in North Africa, and in the Middle East.

Robert E. Lindquist takes over as industrial sales manager

The announcement comes from R. F. Dauenhauer, general sales manager for Hills-McCanna Co. Lindquist, former eastern regional sales manager in New York City, has been with the company for 10 years in various sales capacities.

PUT YOUR LP GAS ON THE MAP



Avoid uncertain deliveries and artificial shortages. Arrange to have your LPG shipped via Mid-America Pipeline . . . the underground highway that weather can't block. Seven conveniently-located delivery terminals serve the entire upper midwest.

Do your Distributors and Customers a favor — put your products on the M.A.P.* call —

MID-AMERICA PIPELINE COMPANY

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Which one contains Olin ethanolamine*

*the one that's closest to you

(of course!)

The closer the source, the faster the delivery. That's why Olin Mathieson sees that there's a distributor of Olin ethanolamine within a short haul of your gas purification installation.

In the Southwest, when you need a shipment of ethanolamines, (mono-, di-, or tri-), save time and operating costs by calling one of the distributors listed below. They have ample bulk and drum stocks ready for immediate delivery to your site. For the name of nearby distributors in other areas, for product specifications or samples, phone or write OLIN MATHIESON, Organic Chemicals, 745 5th Avenue, New York 22.

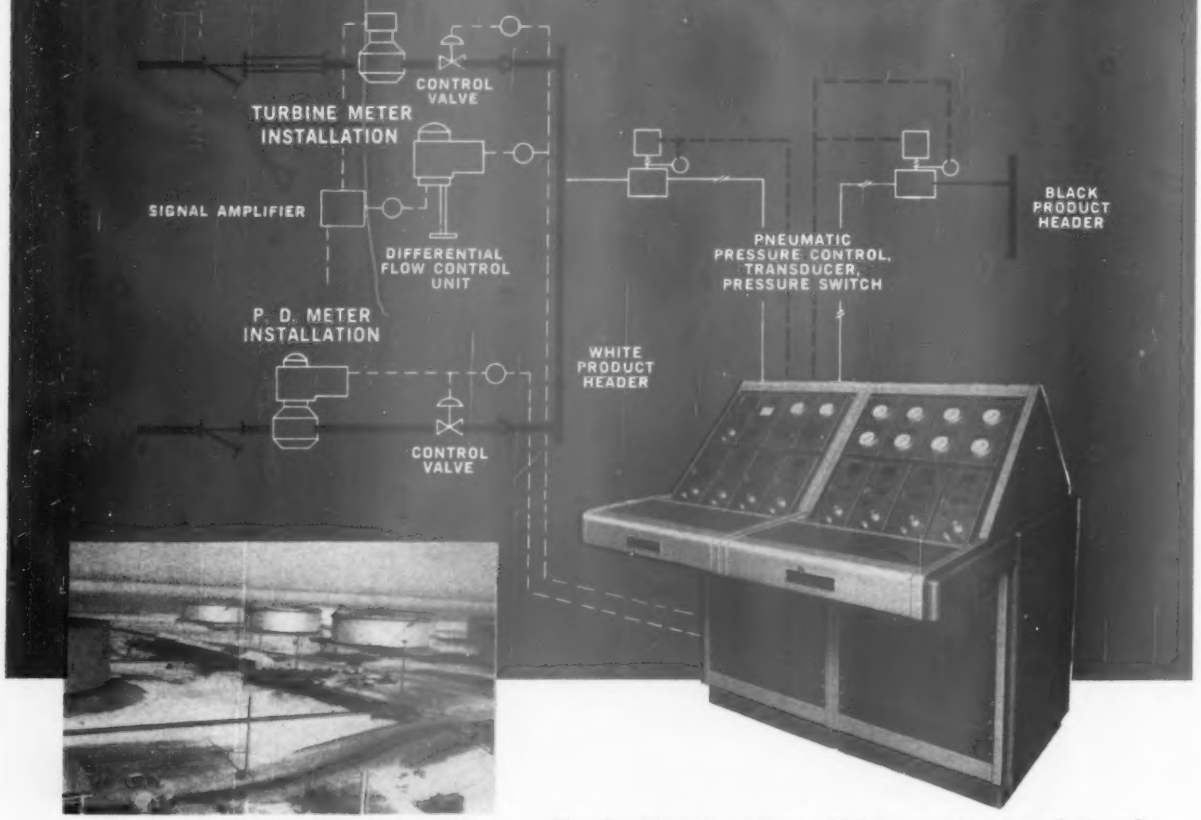
ORGANICS DIVISION **Olin**

Ethylene Oxide • Ethylene Glycols • Polyethylene Glycols • Propylene Oxide • Propylene Glycols • Polypropylene Glycols • Ethanolamines • Glycol Ethers • Surfactants • Ethylene Dichloride • Propylene Dichloride

• L. H. BUTCHER CO., 3628 E. Olympic Blvd., Los Angeles, Calif. • WESTERN CHEMICAL & SUPPLY CO., 700 S. Locust St., Borger, Tex. • RANGER CHEMICAL CO., 2000 Preston Ave., Houston, Tex. • WESTERN CHEMICAL & SUPPLY CO., P. O. Box 2175, Farmington, N. Mex. • WESTERN CHEMICAL & SUPPLY CO., 627 W. First St., Odessa, Tex. • CHEMICAL SERVICE, INC., P. O. Box 1282, Oil Center Station, Lafayette, La. 252

B·I·F POSITIVE CONTROL OF MATERIALS FLOW

WORLD'S LARGEST IN-LINE BLENDER, ON STREAM IN SAUDI ARABIA



IN-LINE FACILITIES INSTALLED ON PLATFORM STRADDLING SHIPPING PIPELINES.

ONE OF FIVE METERING STATIONS, EACH TIED TO AT LEAST TWO CRUDE AND PRODUCT LINES.

The Arabian American Oil Company's new electronic blender delivers 20,000 bbl. and up per hour . . . tailors crude to suit individual refiners!

At Aramco's Ras Tanura terminal, B-I-F's high capacity in-line system blends crudes with products or other crudes — provides flexibility to handle anticipated increased demands for specially blended crudes and refined products. This modern installation's features include:

- Pipeline blending of petroleum mixtures reduces need for intermediate shore tank storage and requirement for mixing of crude with refined products in ships' tanks . . . assures uniform end product.
- Offtaker's order for blend composition and total quantity required by waiting tanker is remotely set by electronic controls . . . blend starts running to carrier immediately after fast, preformulation, "dry run" tests.
- Compact control console, with exclusive interchangeable modular construction, achieves maximum efficiency in minimum space.

Performance-proved in process industries throughout the world, B-I-F blending systems increase production while cutting investment and operating costs. Write for Bulletin 2000.20-1

B-I-F Industries, 377 Harris Ave., Providence 1, Rhode Island.

B·I·F Industries

A DIVISION OF THE NEW YORK AIR BRAKE COMPANY

METERS • FEEDERS • CONTROLS / CONTINUOUS PROCESS ENGINEERING

Joy Mfg. adds K. W. Priester to its export sales staff

K. W. Priester

Priester, who will represent Joy's Baash-Ross Division, has been in the oil-field-supply export business since 1937. According to the announcement by E. W. Carne, manager of export sales for the division, Priester will headquarter in New York City.

J. D. Hitch, Jr. will head B&W international sales

J. D. Hitch, Jr.

Joseph Delano Hitch, Jr. has been appointed general manager, international sales, for Babcock & Wilcox Co.'s Boiler Division, according to L. S. Wilcoxson, B&W vice president. Hitch is former president and chairman of the board of Dorr-Oliver, Inc., where he had more than 33 years experience in international operations.

Directing all international sales activities for B&W's Boiler Division, Hitch will make headquarters in New York. Since joining the company in September of this year, he has been assistant to S. T. Mackenzie, vice president in charge of sales for the Boiler Division.

W. G. Hein assumes duties as general manager of Varec, Inc.

W. G. Hein

The announcement comes from Ray V. Long, president of the firm. Hein joined Varec in 1952 as assistant chief engineer, moving up to chief engineer in 1956, then chief applications engineer in 1959. His new duties will cover all mechanical aspects of Varec's interests at the Compton, Calif. facility. The company manufactures tank fittings and related equipment.

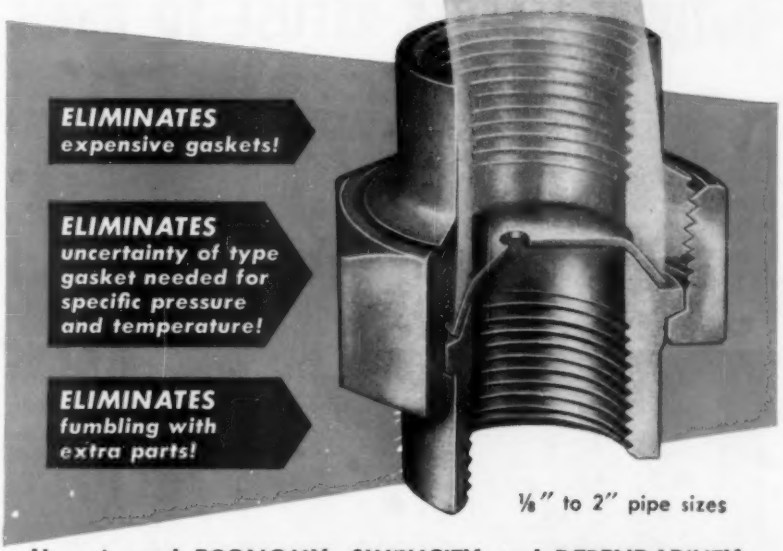
this Catawissa Cup–Orifice plate

CONVERTS

any standard CATAWISSA UNION

into a gasketless ORIFICE UNION

with satisfaction fully guaranteed!



Here is real ECONOMY, SIMPLICITY and DEPENDABILITY for metering, measuring, controlling any piped material!

Catawissa Cup-Orifice Unions were placed on the market during 1958 to field-test research findings. User reports came back with higher than expected compliments and orders poured into the factory!

Now, the full economy story can be told! Orifice Union problems of the past are gone forever! Inventory is simplified, because you can convert any standard Catawissa Union into a gasketless orifice union. Your choice of a stainless or carbon steel cup-orifice plate (blank or drilled) fits easily, quickly, securely in place between the union head and tail pieces to form a good, tight, leakproof seal!

Temperature and pressure requirements are now governed by the rating of the union itself (3000-lb service, 9000-lb test)!

Just specify "Catawissa Cup-Orifice Plates" or "Catawissa Cup-Orifice Unions" at your favorite supply store — or write direct for free catalog and complete information.

PIPE UNION SPECIALISTS — SINCE 1917

CVF CATAWISSA VALVE & FITTINGS CO.

CATAWISSA • PENNSYLVANIA

S. E. HUEY & CO.

ENGINEERS & SURVEYORS

BERNHARDT BLDG.

MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS

Charles Lamar DeuPree named executive secretary of AOSC

The Association of Oilwell Servicing Contractors has national headquarters in Dallas. The AOSC is a national association of contractors who service oil and gas wells throughout the United States.

Reed Roller Bit boosts Cannon

W. F. Cannon has been promoted to executive assistant to the executive vice president, R. L. Walker, in which capacity he will serve as personnel director for the Houston-based firm. Cannon has been associated with Reed the past 9 years.

Mission Mfg. Co. appoints two new sales representatives

Howard S. Barksdale will serve the firm's Texas Gulf Coast area

H. S. Barksdale

T. E. Duhon

with headquarters in Houston. Truby E. Duhon will represent Mission in the Louisiana Gulf Coast territory with headquarters in Lafayette.

Prior to joining Mission, Barksdale served as a division special sales representative and field engineer for an oil - field - equipment manufacturer. Duhon was previously with the Louisiana branch of Tretolite Co.

Thornhill-Craver Co. names two Louisiana sales representatives

H. O. (Jack) Duncan, associated with Houston Oilfield Material Co. and Louisiana Supply since 1939, will headquarter in Lafayette. James B. Wilkerson will represent the Houston maker of Unibolt products and Jet filters in Arkansas, North Louisiana, and Mississippi. He will be located in Shreveport. Wilkerson formerly represented Black, Sivalls & Bryson in the same area.

DeZURIK VALVES REFUSE TO BIND!

The easiest-action of any valves—that's the friction-free eccentric-action of DeZurik Plug Valves. The plug moves freely without body contact—can't rub, won't clog, never binds. Without lubrication . . . with just a smooth, fast quarter-turn . . . DeZurik Valves throttle from full-open to dead-shut . . . every time for thousands of times. Sizes to 30", manual or actuated. ASK FOR BULLETIN 110.

DeZURIK Corporation
SARTELL, MINNESOTA

W. C. NORRIS

Target

ECONOMY • SERVICE • SAFETY

WRITE FOR NEW WELL HEAD BULLETIN P. O. BOX 1739, TULSA

TUBING ss CASING HEADS

Deeper drilling evident in Oklahoma

ACCORDING to a recent summary report in Oklahoma, there were 45 operations drilling below 10,000 ft. in the state. Although this wasn't a complete report on every drilling well, its prime significance is the number of ventures that are now drilling below 10,000 ft.

Of 224 representative wells, 36 were in the 10,000-15,000-ft. range and 9 were working below 15,000 ft. Leading the deeper activity were Dewey and McClain counties with six ventures each. Other counties reported with wells below 10,000 ft. were Latimer County with four, while Blaine, Garvin, and Washita had three each. Counties with two apiece were Caddo, Canadian, Custer, Grady, Grant, Kiowa, and Roger Mills.

The deepest average depth of all wells drilling for an area were in Washita where the median depth of wells reported was 17,274 ft. Currently the western portion of the state is undergoing renewed activity and there is an appreciable amount of wildcatting in that region.

DRILLING AID is this steel drilling-line reel which has 7,500 ft. of 1¼-in. line. Reel can handle 8,500 ft. of drilling line. It is very handy in moving and protects the line on location. Wooden spools have been known to split and break while being moved. Damaged wooden spools have tangled the line and required the line to be respooled or rewound. Operation is Continental et al. 1 Corn unit, 19-11n-14w, Washita County, Oklahoma. Drilling unit is Parker Drilling Co. Rig 66.

Sidelights of AAODC Houston meeting

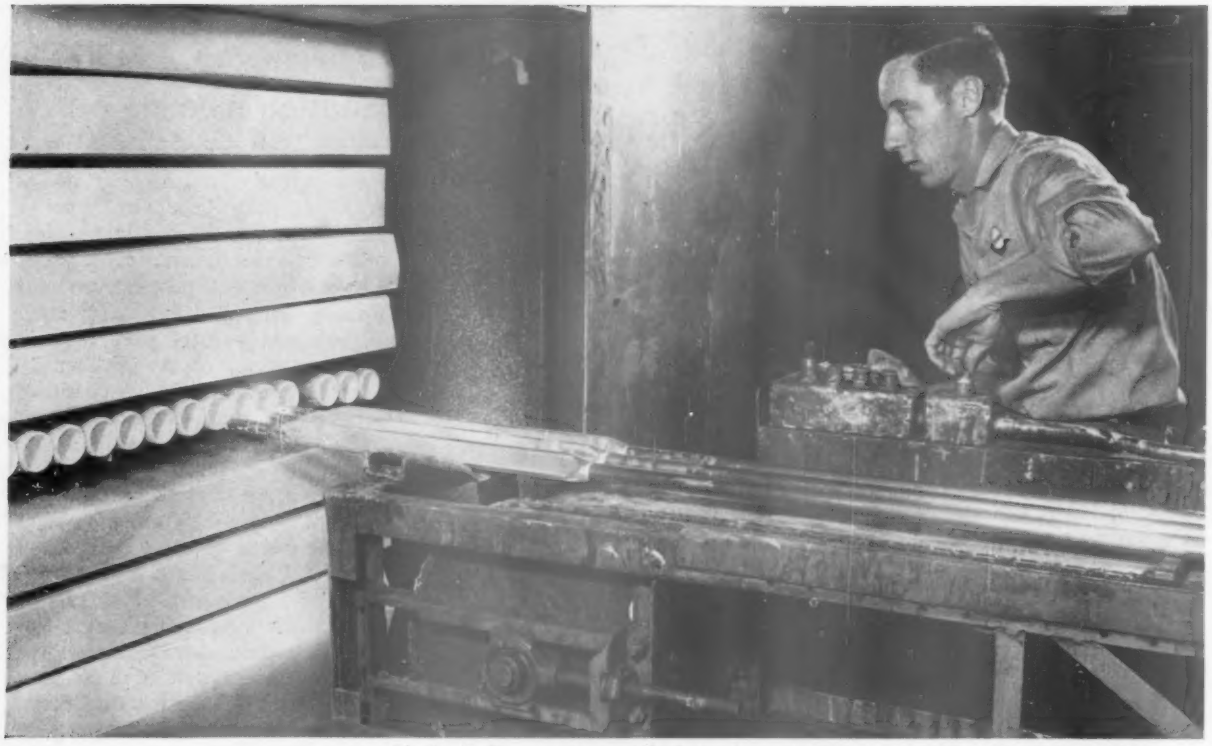
IT WAS generally felt that the twenty-first annual meeting of AAODC, held at the Rice Hotel in Houston earlier this month, was one of the best meetings in recent years.

More than 600 people from contracting and operating firms from all over the country were present. Representatives of the drilling industry from some foreign countries came from lands as distant as Australia.

Notably lacking was a mood of pessimism. The contractors concurred that although business wasn't the best that it had ever been, there were some indications that an upswing is in the offing. More important was the joint feeling that it was up to the contractors themselves to improve their present lot in life. One of the main ills confronting them, they realized, were certain unsound business practices. The most notable were those which related to improving the contract agreements, written or implied, between contractors and operators (OGJ, Oct. 9, 1961, p. 80).

Another factor that was the cause of some of their troubles was the present and future aspect of the drilling crews' work week. Whether to increase the present 52-hour-week basic wage or to shorten the number of hours with the same pay proved to be a controversial issue. Although they couldn't agree on the immediate solution, they concurred as a group that something had to be done. One committee member cited the need for immediate changes because of a growing lack of experienced personnel. Experienced drilling men were claimed to be drilling into fields outside of the petroleum industry (OGJ, Oct. 16, 1961, p. 68).

The group appeared to be particularly impressed with the dynamic outlook of its new president, William P. Clements, Jr., president of Southeastern Drilling Corp., Dallas. Not only did he head a committee on sound practices as its chairman in the personnel and wage discussion, but he also delivered a paper related to the unsound practices now being written or implied in drilling contracts.



Plastic Applicators uses specially designed spraying lances to apply uniform plastic coatings.

Why do some pipe coatings outlast others?

One reason is that some plastic formulations are superior to others.

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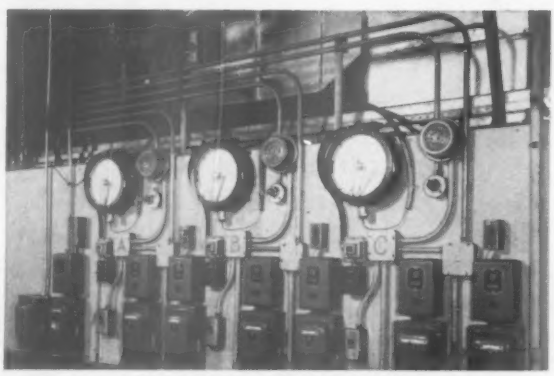

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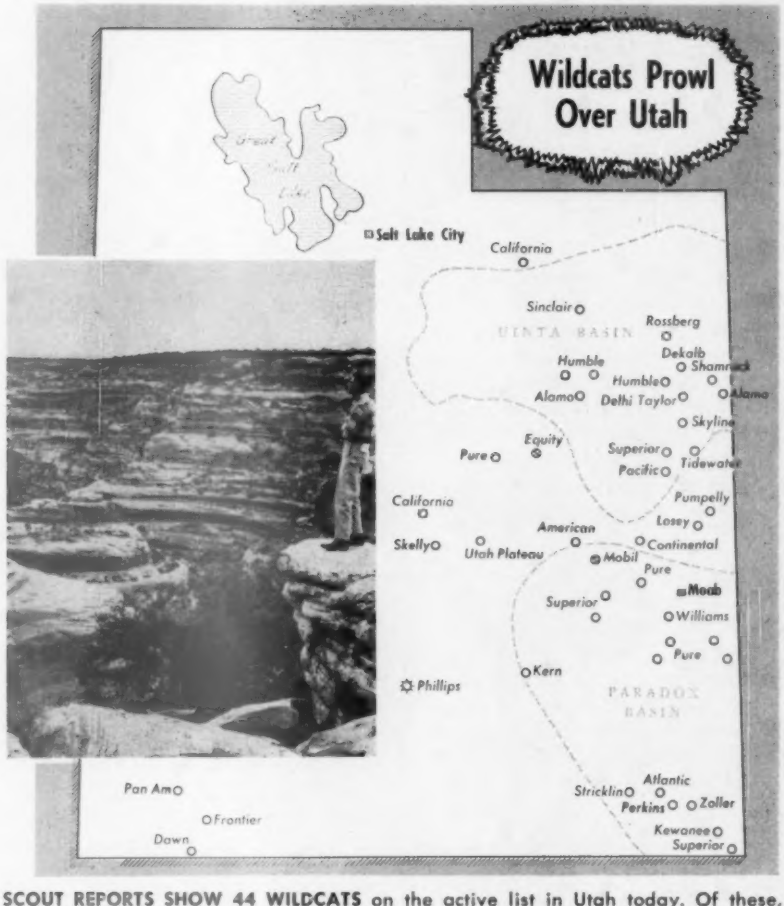
BETTER COATINGS THROUGH RESEARCH

PLASTIC APPLICATORS, INC.



SCOUT REPORTS SHOW 44 WILDCATS on the active list in Utah today. Of these, at least six should be successful, if wildcat experience thus far in 1961 holds good.

What's behind Utah's quickened activity?

BY FRANK J. GARDNER

ONE OF this year's highlights in exploration has been the emergence of Utah as the wildcatter's fair-haired child. A glance at the map on this page reveals no fewer than 44 new-field wildcats on the way down.

For the most part, these are peppered over the eastern half of the state. Three explorers are digging in the southwest corner, while the northwest corner is dead quiet. Interest seems to be about evenly divided between the state's two major basins, with 15 operations in the Uinta basin, 18 in the Paradox, and 11 on the intervening uplifts.

Everybody's in the act. Another interesting factor in the Utah play is the number of different companies involved. Thirty-two companies are drilling the 44 wildcats; of these, 11 are majors and 21 are independents. Pure Oil Co. is the most active one on the list, with six tests on the books; Superior Oil Co. is second in line with four, and Humble Oil & Refining Co. is third with three. California Oil Co. and Alamo Corp. have two operations each, and the remaining 27 companies have one each.

What's behind all this? Many things. Plenty of drillable prospects, plenty of available acreage at reasonable cost, expiring terms on older leases, pipeline outlets built and abuilding, and . . . success. The ratio of wildcat hits to misses so far in 1961, while not exactly high, is at least respectable. Out of every 7 ventures, 1 has hit pay dirt this year, with 13 new fields on record.

And some of those new fields are destined to be outstanding. The Island unit strike by Mountain Fuel Supply Co. in Uintah County started the year off with a 23-M.M.c.f. gas flow from Wasatch-Eocene sand at 5,500 ft. At about the same time, the Paradox basin countered with the Anido Creek oil find at Champlin Oil & Refining Co. and Murphy Corp. 1 Navajo-III in San Juan County; this well made 2,085 bbl. of oil per day from Ismay-Pennsylvanian at 5,300 ft.

At least two summertime discoveries in Utah can be called major events. These were Pan American Petroleum Corp.'s 1 Salt Wash, in Grand County (Mississippian oil at 8,700 ft.), and Pure's 1 USA-Big Indian in San Juan County (Mississippian gas and condensate at 9,900 ft.).

As the hunt goes on. Of the 44 wildcats now drilling or spudding, 6 should be discoveries, if the 1961 success ratio holds. So far, only one has indicated production; Phillips Petroleum Co.'s 2 Escalante Anticline in Section 29-32s-3e, Garfield County, has flowed as much as 24,800 M.c.f. gas per day from Permian and Pennsylvanian beds between 2,247 and 3,679 ft. There's only one catch—the gas won't burn. And there's little market for CO_2 in the Escalante country.

Nevertheless, this widespread interest in Utah bodes well for the oil future of that state. It's still largely an untapped treasure chest.

Here is the gist of Colombia's new oil law

COLOMBIAN OIL-HUNTERS are now under a new oil law that will sharply increase the cost of drilling in the country.

The law ends the 50-50 profit split which has limited income tax and royalty payments to a maximum of 50% of the net. The government continues to recognize rights acquired under existing contracts. This new law does not affect existing exploration and producing operations. The measure increases surface rentals and royalties on government lands. It also raises the exploitation tax on private-land production.

The new law expresses rental fees on a concession acreage in terms of U. S. dollars per hectare, rather than in pesos. In western Colombia, the sliding scale of rentals will rise to $3 per hectare over a 6-year period after which payments will level off. Under the old law, rentals ranged from about 3.5 cents to 45 cents per hectare. In the Llanos, rentals will rise from 10 cents to $1 per hectare, compared with 1.5 to 7.5 cents previously.

Royalty payments on future production from government lands will be 11.5% in the Llanos and 14.5% elsewhere. This compares with the old 3% in the Llanos to 13% in the coastal area, depending on distance from Tidewater. Royalties will be payable in cash or kind at the government's option. The government can request either U. S. or local currency. Royalty on gas output is the same as for oil.

Exploitation taxes on lands where private owners hold subsurface rights will be 6.5% in the Llanos and 8.5% elsewhere, also payable in either cash or kind. This tax used to vary from 0.5% on areas more than 560 miles from Tidewater to 7% in coastal regions.

Concessions cut. The new law cuts in half the acreage maximum for each concession. In the west the limit is now 25,000 hectares, and in the Llanos 100,000 hectares. The original area must be cut by 50% in the first year of exploiting. The relinquished areas can be put up for bidding on terms more favorable to the government.

Exploration periods will now be 8 years in the Llanos and 6 years elsewhere, reduced from 13 and 11 years. Minimum footage figures are now specified. Exploitation periods will be granted for 30 years in the west with longer periods if a good discovery is made on the Llanos.

Depletion allowance. Normal depletion allowance of 10% of the gross value of oil and gas produced and saved, less royalties, will be granted. This will be limited to 35% of total net income before depletion. This allowance will be given operators until capital investment, other than investment in depreciable land or property, is amortized. When the investment is amortized, an income-tax exemption of 10% of the gross will be made.

Any exploration begun after January 1, 1955, gets another 15% special allowance — 18% in the Llanos, after the initial investment is amortized, if the allowance is invested in exploration, refining, pipelines, or power plants in the country within 3 years. The totals of both normal and special depletion are not to exceed 45% of net income.

The old law specified that an allowance of 25% of the gross—28% of the Llanos—was made if an operator spent $800,000 per year outside his producing concession.

A big future awaits Colombia's oil industry. Now the third producer on the continent, production rises in the future will force the need for more oil reserves. The country's oil-barren basins will get needed wildcat campaigns. There have been shows in many widely-scattered tests throughout the country.

Someone will find oil in basins other than the Magdalenas. Now that the nation's new oil law is in force, companies will lose the indefinite attitudes of 1960. More discoveries like Santos and Payoa add luster to the Magdalena Valley oil search, while the first commercial prospects found by Texaco on the Llanos open a new province to the drill.

The next few years of drilling will be interesting to watch in Colombia.

Colombia takes

SUCCESSFUL EXPLORATION for oil in Colombia has taken a much-needed turn to the better in 1961. Colombia-Cities Service Petroleum Co.'s recent Payoa discoveries in the Middle Magdalena Valley are being tagged as one of the most significant oil developments in recent years.

In September Cities Service got its second success on its 75,000-acre discovery block in the Middle Magdalena Valley at 2 Payoa. This offset discovery flowed 2,200 bbl. of oil daily from three zones between 9,400-9,700 ft. Tests were through chokes from 3/8 to ½ in. Gravity is 34°. This new big well is 3,100 ft. due south of the 1 Payoa discovery. That April strike flowed 5,410 bbl. of oil per day from five zones topped at 6,895 to 8,278 ft. Pays at the second well are lenticular Tertiary sands, similar to the lower pays of the field discovery well. The 2 Payoa found gas in one of the upper pays of 1 Payoa, while the other of the top Payoa sands was present in the second well.

Cities Service has now spudded 3 Payoa about 6 miles southwest of the No. 2 well. Location of these important wells is about 30 miles northeast of Barrancabermeja and 160 miles north of Bogota. The Payoa wells offset Sinclair Colombian's four wells at Santos which lie on a concession adjoining the Cities Service acreage on the west. The 1 Santos lies about 1½ miles north-northwest of 1 Payoa. Colombia-Cities Service is operator on the block for itself and three partners, Ecopetrol, Richfield Oil Corp., and Pan American International.

Sinclair 1 Santos well was completed in 1960. It was completed as a producer from two zones. From the deeper pay at 8,992 ft. the well flowed 570 bbl. per day on 5/64-

exploration upswing

BY JOHN C. McCASLIN
Geological editor

in. choke. The well made 1,600 bbl. daily on a test of the same zone on 23/64-in. choke. It flowed 2,500 bbl. per day on test through 34/64-in. choke. A zone at 8,809-39 ft. was good for 1,644 bbl. per day on 23/64-in. choke.

Location of Santos field is about 34 miles northeast of Barrancabermeja on a 215,060-sq.-mile concession held jointly with International Petroleum Colombia, Ltd. Sinclair is the operator. Location of the Santos discovery is on the upfault side of the structure.

Last year saw a decline in Colombian drilling activity. This letdown was due to the industry's uncertainty there, doubts of the future of oil policy of the government, and the world oil supply.

Wells drilled in Colombia last year

Total wildcats	Oil	Gas	Dry	Success ratio
51	8	3	40	21.5%
Total field wells				
80	65	1	14	82.5%

Last year's important discoveries were the find at Santos, the Ecopetrol 9 Llanito discovery northeast of Galan field near Barrancabermeja in the Middle Magdalena Valley (3,120 bbl. per day from Mugrosa Oligocene at 7,790 ft., and Texaco's 1 Guavio find on a foothills structure of the Eastern Cordillera (flowed 554 bbl. daily from lower Tertiary at 9,507 ft., opening first production in the Llanos).

No. 3 in South America. Colombia is the third-largest oil-producing nation in South America. Its daily output of 144,100 bbl. in July this year compares with Venezuela's 2,856,200 bbl. per day, and Argentina's 230,500 bbl. per day. Cumulative production in Colombia is more than 960,000,000 bbl.

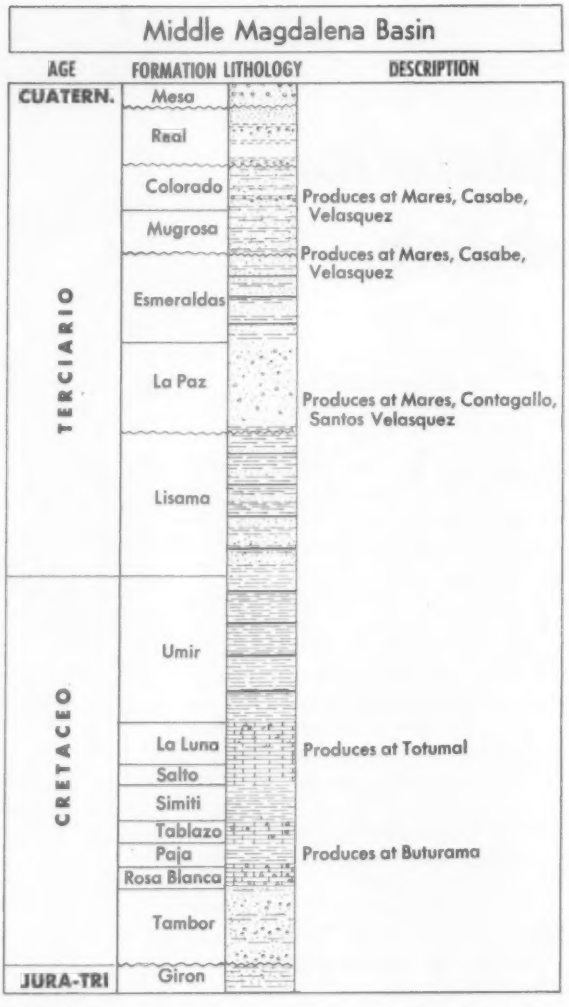
OIL-FINDING IN COLOMBIA has been under way since 1907, but the results have been rather negative. The recent Payoa discoveries in the Middle Magdalena Valley promise a badly needed reappraisal of the country's oil prospects.

The first oil-well drilling in the country began in 1907 on the Caribbean coast. Oil policy in the country toward exploration has included the recognition of private oil and the granting of concessions to look for and develop oil. Colombia's geography has hindered the development of its oil resources to a certain extent. The nation's fields are far from ocean outlets. Any future discoveries out of the Magdalena Valley region of the country will move the source of oil even farther. The Magdalena River, one of the country's transportation lifelines, has been oil's biggest friend. For it is here that most of Colombia's oil is found and refined.

Geologic notes. Colombia has eight basins in which to look for oil. Basins line both the Caribbean and Pacific coasts, follow the Magdalena Valley to its mouth, and cover a rather large part of the northeastern and southwestern portion of the country. The western half of the country is mountainous while the eastern part is an immense lowland plain forming part of the Orinoco and Amazon drainage systems.

The Andes enter the nation from Ecuador on the southwest, dividing into three ranges as they progress into the country—the Western, Central, and Eastern Cordilleras. The Cauca River Valley separates the western and central ranges, and the Magdalena Valley separates the central and eastern ranges.

THIS OIL-FIELD AND PIPELINE MAP of Colombia, South America's third-largest oil producer, looks busy, but much more exploration is needed to determine the country's full oil wealth.



PRODUCTION in the Middle Magdalena basin of Colombia comes from rocks ranging in age from Lower Cretaceous to Colorado Tertiary.

The Magdalena basin is a huge half-graben. Rocks of Cretaceous age are widely distributed throughout Colombia. The Cretaceous sediments offer an extremely regular facies in the Middle Magdalena Valley in comparison with the country's Tertiary rocks. Cretaceous strata are more than 4,000 m. thick in the valley. Most of the Tertiary rocks were deposited in fresh-to-brackish water. They consist of fine-to-coarse clastics which are more than 8,000 m. in thickness. There are abrupt changes in coarseness, thickness, and character of the Tertiary sediments which occur along regional strike.

There is not much known about the occurrence of oil in the Cretaceous, since to date the only fields with Cretaceous oil are Buturama and Totumal. The Middle Magdalena Valley was just a small part of a vast geosyncline during Cretaceous time. Regional evidence indicates that these two fields are not located along the flanks—thus they produce only paraffin-base oil, lending weight to the idea that lighter oil is generally found in structural traps toward the center and deeper parts of the basin. Tertiary oil at Cantagallo, Casabe, La Cira-Infan-

Magdalena Valley oil-field data

Field and location—	Pay zone	Structure	Reservoirs & reservoir fluid	Discovery date
Buturama, 15 km. northwest of Totumal field	Basal limestone of Cretaceous.	Small anticline.	Fractured-limestone. 37° oil.	1953
Totumal, Dept. del Magdelena	La Luna Cretaceous. Salto Cretaceous.	Small, faulted anticline.	Fractures. 25°, 1.8% S.	1951
Cantagello, 20 miles north of Casabe field	Cantagello Eocene	East-dipping monocline.	Sands. 20.7°, naphthenic.	1943
Casabe, Yondó concession	Colorado, Mugrosa, Oligocene, La Paz Eocene.	.....	Sands. 18°-23°.	1941
La Cira-Infantas, DeMares concession	Colorado, Mugrosa, La Paz Tertiary.	Long, narrow, north-south-trending anticline.	Loosely consolidated. Tertiary sands. 21.4°-27.9°.	1918 1926
Velasquez, Middle Magdalena Valley	Tune, Avechucas.	Gentle monocline, 18.4°-27.6° in Avechucos. 14.1°-17.8°—Tune.	Sands.	1946

tas, and Velasquez is found on the shallower margin of the original Tertiary basin—thus the heavy, asphaltic-base oils. The lighter Tertiary oils in the Middle Magdalena Valley are found in the deep part of the modern basin.

Though it hasn't been proven, it is thought the Tertiary oil migrated from the Cretaceous beds.

Illinois reports no new pools

No new oil or gas pools were discovered in Illinois in September.

There were three extensions to pools, as follows: One oil well each to Ellery North pool in Wayne County, Patoka South pool in Marion County, and Richview pool in Washington County.

There were 138 new oil and gas tests completed in the 4-week period. The new tests resulted in 50 oil wells and 2 gas wells. In addition, nine tests that previously had been completed as dry holes were reworked or deepened and recompleted as oil wells.

About 1½ miles northwest of Olney, Richland County, in an area in which drilling has been meeting with marked success this year, two more good wells were reported completed in September. The 1 R. Schnepper well, drilled by John B. Murvin in 21-4n-10e, was completed for 92 bbl. of oil per day; and the 2 Voight "A" well, drilled by D. T. Drilling Co. in the same section, was completed for 100 bbl. of oil per day. Both wells are producing from Ste. Genevieve lime.

Two good oil wells were also reported in Eldorado Consolidated pool in Saline County, another area that has experienced successful drilling this year. They are the 2 Albert Farris well in 25-8s-6e, completed by Poc Oil Corp. for an initial production of 188 bbl. of oil a day from Waltersburg sand; and the 2 Sutton Community well in 16-8s-7e, completed by Louis Kapp for an initial production of 200 bbl. a day from Aux Vases sand.

Drilling for deeper oil in Illinois continues. A mile east of Sims, Wayne County, in Covington South pool, Peake Petroleum Co. drilled its 1 Henson in 14-2s-6e, to a total depth of 5,280 ft. The Warsaw lime, topped at a depth of 4,152 ft., tested water. The well was temporarily abandoned after pumping 5 bbl. of oil and a lot of water from Dutch Creek sand, topped at 5,273 ft. Near the 1 Henson well, in the same section. Peake Petroleum Co. drilled its 1 Kisamer well to a depth of 4,174 ft. and completed it for an initial production of 34 bbl. of oil a day from Harrodsburg lime, topped at 4,139 ft.

Estimated production for Illinois in September is 6,411,000 bbl.

Sooner discoveries stretch over entire state

WILDCAT and development drilling in Oklahoma came up with widespread good results last week. Discoveries and important field wells were noted from the Arkoma basin in the southeast clear through the state to the Panhandle.

Haskell County. Ambassador Oil Corp. is testing at two wells in the Arkoma basin. The 1 Richison unit, C NW SE 32-8n-20e, Kinta field, flowed 3,024 M.c.f.d. for 40 hours from 5,625-37 ft. on ½-in. choke. At Northwest Kinta, 1 Wimberly unit, C SW NE 27-8n-19e, flowed 3,150 M.c.f.d. on ½-in. choke from 6,007-40 ft.

In Pittsburg County, southeastern Oklahoma, Steve Gose has a gas discovery at 1 Browne in E½ NW NW SE 28-7n-16e, 2½ miles southwest of Blocker. The well flowed 1 M.M.c.f.d. from Hunton Siluro-Devonian at 8,461 ft. during tests.

At Norris field, Midwest Oil Corp. 1 Coblentz, SE SW NE 16-6n-22e, flowed 2,130 M.c.f.d. on open flow test of the Red Oak sand through perforations at 6,932-7,036 ft.

Southern Oklahoma. In the eastern end of the Marietta basin, Pan American Petroleum Corp. completed a significant basal McLish Ordovician discovery inside East Durant gas field. The 1 Callahan-Lee, C NW 34-6s-9e, flowed 246 bbl. of 33.9°-gravity oil per day through 24/64-in. choke from perforations in the basal McLish at 8,043-99 ft. From Bromide Ordovician sand at 7,351 to 7,531 ft., the well flowed 3,126 M.c.f.d. on 1-in. choke.

At Southeast Aylesworth field, Bryan County, Jake L. Hamon completed a triple producer at 1 Haden in C SE NW 22-2s-7e. The well flowed 168 bbl. of oil per day on 12/64-in. choke from a new pay, basal McLish, at 6,734-40 ft. From Second Bromide sand at 5,876-5,950 ft. the well made 179 bbl. daily on 12/64-in. choke; from Third Bromide sand at 6,100-12 ft., the well flowed 140 bbl. daily on ¼-in. choke.

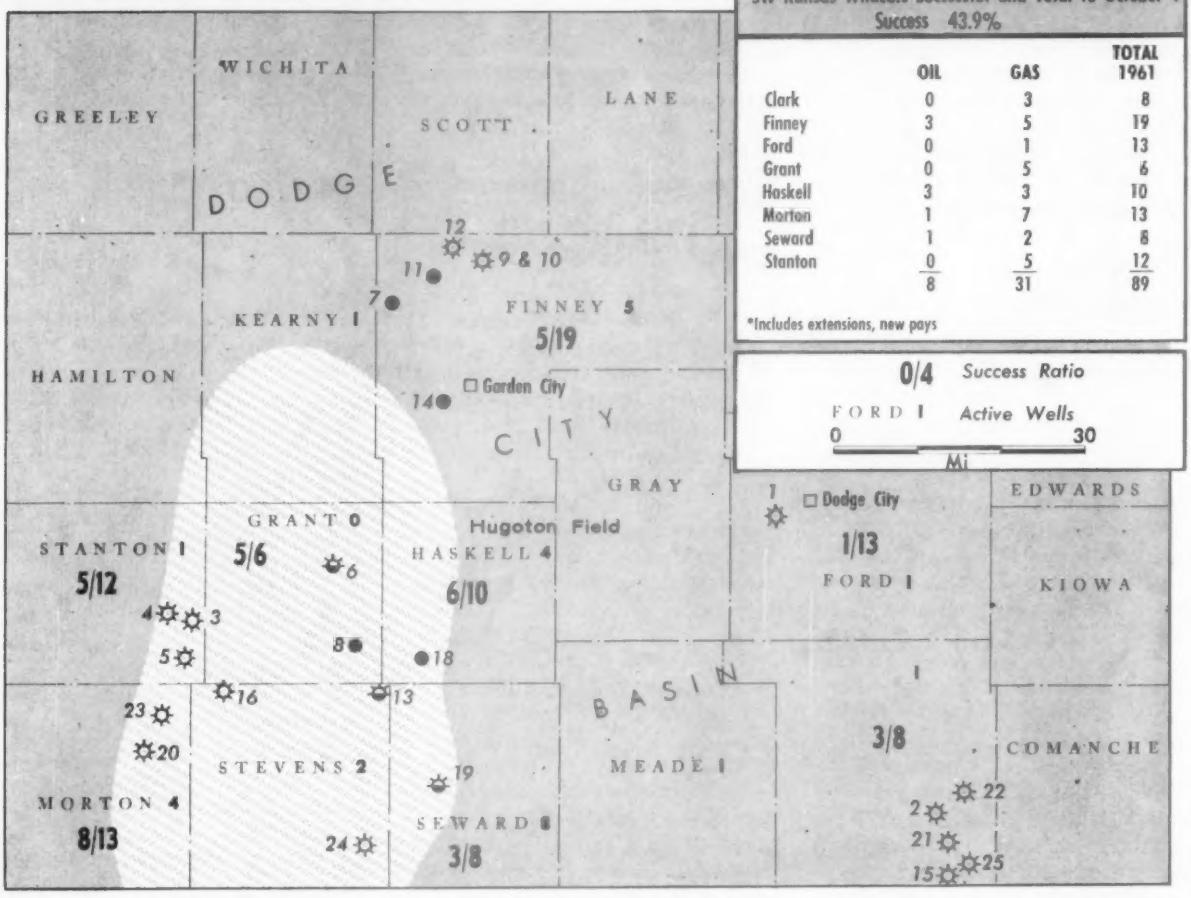
Central Oklahoma. Harper Oil Co. completed 1 Oltmanns in C SW NW 14-18n-5w, Kingfisher County, as a dual-zone oiler. The well flowed 27 bbl. per day on ½-in. choke from Oswego at 5,884-93 ft. and 30 bbl. of oil per day on ½-in. choke from Meramec open hole at 6,154-6,334 ft.

Joiner City. Trice Production Co. has an excellent three-pay discovery in Joiner City field, Carter County, at 1 Sarasota, SW SW SW 7-5s-2w. The well flowed 233 bbl. per day on 22/64-in. choke from Upper Chimney Hill at 8,446 ft.; 278 bbl. per day on 24/64-in. choke from Bois d'Arc at 9,263-9,370 ft.; and 149 bbl. daily on 18/64-in. choke from Lower Chimney Hill at 9,823-80 ft.

Newcastle area. In McClain County, Petroleum, Inc. 1 Thomas-B, C NW SE 24-9n-4w, flowed 1,795 M.c.f.d. on 12/64-in. choke and 80 bbl. condensate from Second Bromide sand at 9,682-88 ft.; from Tulip Creek Ordovician at 9,998-10,016 ft. the well flowed 10 bbl. hourly on 14/64-in. choke.

Oklahoma Panhandle. In Beaver County, Mid-America Minerals Co. completed 1 Phelps in C SE NW 29-4n-23eCM, northwest of Six Mile field, pumping 60 bbl. of oil in 15 hours from perforations in the upper Morrow Pennsylvanian at 6,601-3 and 6,614-20 ft. From lower Morrow at 6,896-6,942 ft. the well flowed 10,800 M.c.f.d.

Southwest Kansas at a glance



*SW Kansas Wildcats Successful and Total to October 1
Success 43.9%

	OIL	GAS	TOTAL 1961
Clark	0	3	8
Finney	3	5	19
Ford	0	1	13
Grant	0	5	6
Haskell	3	3	10
Morton	1	7	13
Seward	1	2	8
Stanton	0	5	12
	8	31	89

*Includes extensions, new pays

0/4 Success Ratio
FORD 1 Active Wells
0 30
Mi

This year's oil and gas discoveries in Southwest Kansas are: (keyed to map)*

1. Ford County: Russell Cobb,, Jr. 1 Turley, 3½ miles southwest of Dodge City. IPF 3 M.M.c.f.d. Krider Permian 2,647-87 ft. Gas discovery.

2. Clark County: Adair 1 York, C NW¼ 25-33s-22w. IPF 5 M.M.c.f.d., Morrow sand 5,398-5,406 ft. Sitka gas field discovery well.

3. Stanton County: Pan American - Appleton Gas unit, 26-29s-39w. IPF 1,205 M.c.f.d., Council Grove Permian 2,710-2,809 ft. New gas discovery.

4. Stanton County: Pan American 1 G. V. Welch Gas unit, C SE NW 17-29s-39w. IPF 522 M.c.f.d., Morrow 5,520-22, 5,476-78 ft. Wildcat gas discovery.

5. Stanton County: Pan American 1 Nicholas Gas unit "C," C NE SW 15-30s-39w. 6 miles east of Shoe field. IPF 9,230 M.c.f.d., Morrow 5,556-74 ft. Gas discovery.

6. Grant County: Columbian Fuel Corp. 21-B Da Vatz, C SE NW 13-28s-36w. IPF 2 M.M.c.f.d., Council Grove Permian 2,846-2,908 ft.; IPF 144 BOPD, Morrow 5,231-32 ft. Dual completion, oil and gas discovery.

7. Finney County: Horizon 1 Barrett, C NW SW 20-22s-34w. IPP 336 BOPD, St. Louis Mississippian 4,768-74 ft. New oil discovery.

8. Grant County: United Producing Co., Inc. 2 McCabe unit, C SE NE 3-30s-35w. IP 120 BOPD, Marmaton Pennsylvanian 4,699-4,701 ft.; IP 190 BOPD, Morrow 5,341-47 etc. Dual completion, new oil discovery.

9. Finney County: A. D. McKelvy 1-20 Greathouse, C NW¼ 20-21s-32w. PF 10 M.M.c.f.d., Krider 2,656-66 ft. Gas discovery.

10. Finney County: McKelvy 1-17 Greathouse, C NW¼ 17-21s-32w. IPF 2,500 M.c.f.d., Krider 2,660-69 ft. Gas discovery.

11. Finney County: Nate Appleman 2 Maune, C NW NW 31-21s-33w. IP 28 BOPD, Miss. 4,654-73 ft. Opens East Nunn oil field.

12. Finney County: McKelvy 1-11 Hipp, C SE¼ 11-21s-33w. IPF 7 M.M.c.f.d., Herrington-Krider 2,581-2,633 ft. Gas discovery.

13. Stevens County: Mobil Oil Co. 1 Cutter, 3 miles southeast of Hickfield, 15 miles northeast of Hugoton in C SW SE 1-31s-35w. IPF 71 BOPD, Morrow 5,312-15 ft.; IPF 1,448 M.c.f.d., Chester Miss. 5,584-5,600 ft. Dual completion, oil and gas discovery.

14. Finney County: Cities Service Petroleum Co. 1 Cowgill "A," 10 miles north of Ivanhoe pool, 2 miles southwest of Garden City in C NW SE 27-24s-33w. IPF 120 BOPD, Morrow 4,815-26 ft. New oil discovery.

15. Clark County: Sinclair 1 Tuttle, C NW SE 8-35s-21w. IPF 8,500 M.c.f.d., some condensate, Morrow 5,590-5,606 ft. Gas discovery.

16. Stevens County: Pan American 1 Hahn Gas unit "C," SE NW 6-31s-38w. IPF 975 M.c.f.d., Morrow 5,655-57 ft. Gas discovery.

17. Stevens County: Mobil 1 Anderson Trust unit, C SW NE 27-31s-35w. IPF 224 BOPD, Chester 6,003-16 ft. Oil discovery.

18. Haskell County: Pan American 1 Black Gas unit "C," C SW NE 17-30s-33w, 1½ miles east of Satanta. IPF 1,630 M.c.f.d., Des Moines Pennsylvanian 4,990-95 ft.; 1,280 M.c.f.d., Morrow 5,270-5,318 ft.; IPF 150 BOPD, Lansing Pennsylvanian 4,420-22 ft. Triple completion. Opens Northwest Lemon field.

19. Seward County: Anadarko Production Co. 1-A Santa Fe Land Improvement Co., 12 miles north of Liberal. IPF 480 BOPD, 1,634 M.c.f.d., Chester 5,976-80 and 5,983-86 ft.; IPF 26 M.M.c.f.d., Morrow 5,548-56 ft. Confirms Mississippian oil production in Evalyn field, opens new Morrow gas sand pay. Discovery well, 1-A Browne, was dual oil and gas Chester discovery.

20. Morton County: Pan American 1 Baker Gas unit "D," 22-32s-40w. IPF 12,240 M.c.f.d., Morrow 5,420-22 and 5,344-46 ft.; IPF 10,818 M.c.f.d. Morrow 5,274-76 and 5,256-58 ft.

21. Clark County: Sunray 1-A Harper, SE NW SE 18-34s-21w. IPF 1,100 M.c.f.d., Morrow 5,374-90 ft. Opens new field 2½ miles south of Snake Creek field.

22. Clark County: Graham-Michaelis 1-8 Wilson, C SW NE 8-33s-21w, confirmation well to Northeast Sitka field. IPF 3,245 M.c.f.d., Morrow 5,298-5,324 ft.

23. Morton County: Pan American 1-B Hayward, C SE NW 35-31s-40w. IPF 30,216 M.c.f.d. Morrow 5,408-15 ft. Kinsler field well.

24. Stevens County: Cities Service 2 Taylor "C," C SE NW 23-34s-35w, 6 miles southeast of Walkemeyer field. IPF 4,870 M.c.f.d., Chester 6,420-34 ft. Gas discovery 14 miles southeast of Hugoton.

25. Clark County: Sinclair 1 Randall, C SE NW 32-34s-21w. IPF 1,200 M.c.f.d., 76 bbl. condensate in 5 hours, Morrow 5,516-32 ft. IPF 1,350 M.c.f.d. and 90 bbl. condensate Morrow 5,489-5,501 ft. Extension area of Southwest Snake Creek field.

*New fields only.

Southwest Kansas makes comeback in search for new oil plays

SOUTHWESTERN KANSAS has made a real exploratory comeback in recent months. For several years, sporadic exploratory success inside and outside the vast Hugoton field in Kansas has been overshadowed by fast-moving plays south of the line in the Oklahoma and Texas panhandles. Not since Greenwood and Pleasant Prairie has Southwest Kansas been so busy looking for pre-Permian gas and oil. In eight counties this year, 8 new oil fields have been opened and 31 new gas pools tapped. This is a healthy 43.9% success ratio in exploratory drilling. In the past couple of years, gas-well completions in southwestern Kansas counties have spiraled upward—a spiral that has also been going up in both the Oklahoma and Texas panhandles.

The pre-Permian rocks in southwestern Kansas still lead in exploratory interest, despite a rather busy Permian gas-hunting period in 1960 and earlier this year. Most of the year's discoveries were in Pennsylvanian and Mississippian zones. Last year, however, there was a series of Chase Permian discoveries around the edge of Hugoton field in Hamilton. Greeley, Haskell, and Ford counties. This year there have been Permian discoveries in Finney, Stanton, and Ford counties. The best Permian gas flow was reported at A. D. McKelvy 1-20 Greathouse in Finney County. It flowed 10 M.M.c.f.d. from Krider at 2,656-66 ft.

Pennsylvanian and Mississippian discoveries appear to be on the definite increase. The Morrow sands, Marmaton, Des Moines, and Chester formations are the chief deep targets in the Hugoton field region. Most of the new discoveries lack the spectacular aspect that we have seen in Oklahoma and Texas in the last Hugoton decade, but a definite sub-Chase group trend is building up in Southwest Kansas.

Lush Morrow fields have been slower in coming to Kansas than to her neighbors to the south, but the list is growing. Near-giants like Adams Ranch, Borchers, Eubank Multipay, Harper Ranch, Interstate, Kismet, Liberal-Light, and Snake Creek should soon have many counterparts. The biggest of all pre-Permian gas areas in Kansas is at Greenwood with its prolific Virgil pays.

Pan American's recent discoveries in Stanton County force a new look at the Morrow inside and outside Hugoton field. The Mississippian rocks have been very productive in Pleasant Prairie field, a multipay area covering parts of Kearny, Finney, and Haskell counties. This field has been the most successful pre-Permian oil harvest in Southwest Kansas. Its tremendous success should fire more future exploration into the Mississippian possibilities.

Kansas is confident that vast areas of its southwestern counties will become more and more productive from deeper-than-Permian rocks. Hugoton embayment operators have watched with pride the advance of Pennsylvanian and Mississippian production across Southwest Kansas, Southeast Colorado, and the Oklahoma and Texas panhandles in one short decade.

This rapid development of new oil and gas reserves in a section of the Mid-Continent that knew only Permian production until Sinclair found Mississippian oil at Lips in April 1949, has been one of the industry's big stories. Even after Lips the deep interest in Hugoton country was slow to start. It wasn't until the middle 50's that drillers really got down to business opening Morrow and Mississippian reservoirs. The success in this four-state area has been phenomenal. Lack of outlets and demand kept a lid on the play for a long time, but gas development is now on an upward trend that appears to have a long way to go.

Kansas drilling adds new finds

CONFIRMATIONS and discoveries highlighted Kansas drilling last week. Schwindt field in Rush County was confirmed, new Arbuckle production was opened in Rich County, Simpson oil was logged at a Harper wildcat, Mississippian production was opened in Hodgeman, Russell County got a new strike, and discoveries were reported in Graham and Barton counties.

Rush County. Kaiser-Francis 1 Jefferies, SW SW SW 12-17s-19w, Rush County, confirms Schwindt Reagan Cambrian field.

A drill-stem test in the Reagan sand at 3,827-33 ft. got 1,685 ft. of clean, gassy oil, and 1,325 ft. of gas. The discovery well was opened last month at Shields Oil Producers Inc. 1 Schwindt "B," SE SE SE 11-17s-19w. The wildcat pumped 35 bbl. of oil per hour during swab tests. Perforations were at 3,849-56 ft. This Cambrian discovery set off a brisk leasing program throughout northwestern 18s - 17w northwestward to 16s-20w. This is the first Cambrian production on the southwest side of the Central Kansas uplift. The discovery well had a thick pay section, with the second well having even better chances for a thick pay.

Arbuckle oil. Thunderbird Drilling Co. Inc. is testing Arbuckle Cambro-Ordovician pay at 1 Tobias in NE NW SW 25-20s-9w, 4½ miles southwest of Lyons, Kansas.

Oil flowed on eight drill-stem tests from more than 170 ft. of good pay section. Tests were made at 3,250 down to 3,380 ft. Location

is 2½ miles southeast of Chase-Silica field.

Harper County. Simpson Ordovician oil was tested at Teeneco Oil Co. 1 Forrest King in C SE SW 1-32s-5w, 3 miles southeast of Gerber field and 11 miles east of Harper.

Drill-stem test at 4,634-39 ft. got 210 ft. of free oil.

Mississippian oil. Sunray Mid-Continent Oil Co. is opening a new Mississippian pool 4½ miles south of Wieland field in Hodgeman County. The 1 Miller estate, C SW NE 8-22s-22w, 7½ miles northeast of Jetmore, got 558 ft. of free oil, 62 ft. of mud-cut oil, 186 ft. heavily mud-cut oil, 62 ft. of oil-cut mud, and 250 ft. of gas during drill-stem tests in the Mississippi at 4,481-93 ft.

A test at 4,496-4,508 ft. got 62 ft. of mud-cut oil, 93 ft. of free oil, 62 ft. of oil-cut mud, and 62 ft. of slightly oil-cut mud, 620 ft. of gas. A test at 4,511-23 ft. got 1,177 ft. of free oil, 120 ft. of oil-cut mud, and 682 ft. of gas.

Three zone find. Birmingham-Bartlett Drilling Co. has a possible tripay discovery in Russell County, 14½ miles southeast of Russell.

The 1 Driscoll "A," NW SE SW 19-15s-11w, found gas in the Topeka Pennsylvanian at 2,790-2,815 ft., Toronto at 2,872-95 ft. and Lansing at 3,002-11 and 3,048-66 ft. Oil was found during Lansing drill-stem test at 3,135-61 ft. The test got 990 ft. of free oil in 1 hour.

Lansing confirmation. Amerada Petroleum Corp. completed 1 Gay Rush in Graham County, NE NW 21-10s-24w, confirming Culp field.

The well pumped 80 bbl. of oil daily from Lansing Pennsylvanian at 3,949-4,010 ft. This field opened last summer at Empire Drilling Co. 1 Culp "A" in C NW NE 21-10s-24w. The discovery well flowed 166 bbl. of oil daily from perforations at 3,839-3,999 ft.

Harper stepout. V. W. McKnab has a confirmation strike ½ mile west of Alfalfa field in Harper County.

The 1 Welch, NW NW 12-34s-6w, recovered 50 ft. of gas-cut mud and oil-cut mud, 180 ft. of very heavily oil and gas-cut mud and 120 ft. of oil during Kansas City Pennsylvanian drill-stem tests at 3,790-3,807 ft. The field was opened last May at Cities Service Petroleum Co. 1 Mattingly, SW NW NE 12-34s-6w. That well made 32 bbl. daily from Kansas City perforations at 3,761-69 ft. Location is 6 miles southeast of Anthony, Kansas.

Barton confirmation flows. Raymond Oil Co. Inc. confirmed Lansing oil production in Knop field, 5 miles northeast of Great Bend in Barton County.

The 1 Wess, NW NW SE 9-19s-12w, made 42 bbl. of oil on tests of Lansing perforations at 3,198-3,208 ft., and is now awaiting state test. The field was opened last summer at 1 Knop in NE NE SW 9-19s-12w. That well made 156 bbl. of 37.1°-gravity oil per day from Lansing perforations at 3,326-31 ft.

Six Kansas counties add strikes

DISCOVERIES and confirmation strikes are widespread in Kansas. Developments were reported in Kiowa, Stafford, Rush, Rice, Morton, and Clark counties:

Kiowa County. Cooperative Refinery Association found Cherokee Pennsylvanian oil production at a new discovery 2 miles northeast of Haviland. The 1 Davis "R," C SE SW 33-27s-16w, 1 mile southeast of Fruit field, flowed 35 bbl. of oil and 500 M.c.f.d. in 1 hour. During a 4-hour test later, the well flowed 145 bbl. of formation oil. When the well was opened, it flowed 21 bbl. of new oil in 45 minutes.

Stafford confirmation. Dunne-Gardner Drilling Co. is shut in at 1 R. Russell, NW SW NW 25-25s-13w. Flow was 30 bbl. of formation oil hourly on test of Lansing Pennsylvanian pay at 3,860½-61½ and 3,865-66 ft. Location is 1 mile southeast of Leiss field and 10 miles south and east of the town of St. John, Kans.

Cambrian discovery. Shields Oil Producers opened a new Cambrian field, Schwindt, SE SE SE 11-17s-19w, 3½ miles northeast of La-Crosse in Rush County.

The well made 76 bbl. of oil per day from Reagan sand perforations at 3,849-56 ft. There was no water with the oil.

Rice County. Thunderbird Drilling Co. 1 Tobias, Arbuckle discovery well in NE NW SW 25-20s-9w, 4½ miles southwest of Lyons, flowed 44 bbl. of oil in 3 hours on ¾-in. choke. On 8/64-in. choke it made 50 bbl. in 24 hours. Perforations are at 3,362-72 ft.

Morton County. Gas was found in the Waubaunsee Pennsylvanian at Petroleum, Inc., 1 Baughman, Sparks field, C NE 18-31s-41w. The well flowed 2,060 M.c.f.d. in 40 minutes on a drill-stem test at 2,878-2,925 ft.

McKinney field extended. This Morrow Pennsylvanian gas field in Clark County was extended 2 miles southeast at Ashland Oil & Refining Co.'s 1 Theis in C NW SE 6-35s-25w, 4½ miles west of Englewood in the southwestern part of the county. The well flowed 4,740 M.c.f.d. on 26/64-in. choke from perforations at 5,884-96 ft. and 2,800 M.c.f.d. at 5,936-38 ft.

First Moenkopi Triassic oil for Utah found in Emery County

Utah's first Moenkopi Triassic oil production was tapped at a wildcat in Emery County. Cities Service Petroleum Co. 1 Government, C NE NW 1-16s-12e, was completed on pump for 84 bbl. of oil and ½ bbl. of water per day.

The oil is 38.8° gravity. Perforations were made at 3,872-3,906 ft. Location of the wildcat is at Grassy Trail. It was first drilled by Cities Service in 1953 at total depth of 7,390 ft. Last August it was reentered for Moenkopi tests. Location is 6 miles southeast of Farnham Dome and 24 miles west of Stone Cabin field.

Moenkopi oil production first entered the Intermountain scene in 1958 at Texaco Inc. 1 Meara in C SW W 19-5n-95w, Danforth Hills field, Moffat County, Colorado. Texaco just recently staked a confirmation try to this discovery at 1 Government-Norvell in C SW SE 19-5n-55w. Danforth Hills field has production from Morrison, Entrada, Weber, and the one Moenkopi well.

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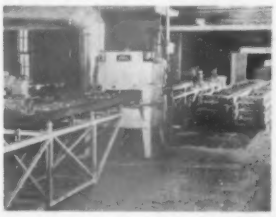

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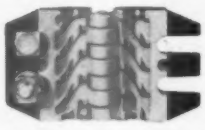

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Two important Panhandle wildcats tap gas production

In Texas Sunset International Petroleum Corp. has completed two significant gas wells in the Panhandle, one of which apparently marks a new gas-field discovery.

Drilling to a total depth of 7,925 ft. in Section II, Block JT, TW&NG Survey, in Ochiltree County, Sunset's 1 Boese well encountered high pressure in the upper Morrow sands and perforated at an interval of 7,828-34 ft. Potential production from natural flow of this well is set at 5 M.M.c.f.d. without fracturing. Wellhead pressure is 2,700 lb.

In addition to the 1 Boese, Sunset completed 1 Wiley well in Section 169, Block 45, H&TC Survey, in Hansford County. An extension of Hansford-Cleveland gas field, this well was drilled to a total depth of 6,079 ft., sand-fractured, and is producing from an interval of 6,038 to 6,048 ft. Potential production is estimated at 4,750 M.c.f.d., with 60 bbl. of condensate. Wellhead pressure is 1,675 lb.

Confirmations feature West Central Texas developments

The confirmation well to newly opened South Old Glory Strawn Pennsylvanian field in northeastern Stonewall County, Texas, was completed flowing 393 bbl. of 40.1°-gravity oil per day. It is Texas Pacific Coal & Oil Co. 8 S. E. May, 7 miles north of Old Glory in the J. P. Holder Survey. It lies 500 ft. southeast of 6 S. E. May, discovery well of the field. Pay was found at 5,069 ft.

Sun Oil Co. completed 1-A L. B. Menille as a dual south extension and confirmation well to the I.A.B. Northeast Pennsylvanian field in northwestern Coke County.

From the lower zone at 6,068-95 ft. in Strawn, the well flowed 163 bbl. of 40.9°-gravity oil per day. From the upper zone in Strawn at 5,150-70 ft. the well flowed 256 bbl. of 41.8°-gravity oil per day through ¼-in. choke. Location is in Section 472, Block 1-A, H&TC Survey, 9 miles northwest of Robert Lee. It lies ¼ mile south of the discovery well in I.A.B. field.

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Louisiana, Mississippi maps available

Three new maps are available from Geo Map Co., Box 30332, Dallas 30. Maps 303, 304, and 305 cover the entire South Louisiana and Mississippi area. The major work of the two South Louisiana maps has been the subdivision of the Cenozoic section into biostratigraphic units. Each field has been printed with a color legend which denotes the geological age of its pay horizons. The maps fit together to form a 45 by 69-in. wall map of the entire South Louisiana area. Biostratigraphic units include the Pleistocene, Pliocene, six units in the Miocene, five units in the Oligocene, and three in the Eocene.

There are a great deal of data on the maps. Regional structure contours and location of tectonic features, a columnar section, year of discovery, cumulative production figures to January 1, 1961. Scale on the Louisiana maps is 1 in. equals 4½ miles. Generalized geologic structure is on top of the Het and various Miocene horizons. Price is $35 for each half. The Mississippi map is on a 1-in.-equals-5-miles scale. Contours are on top of the Eutaw and Lower Tuscaloosa. Price is $35. Also available is Map 301, Jurassic Drilling in Northeast Texas, contoured on top of the Smackover. Price is $25.

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Cleveland sand discovery completed in Texas Panhandle

Cleveland sand Pennsylvanian oil production was tapped at a wildcat in south-central Lipscomb County, Texas Panhandle. The discovery well is Shamrock Oil & Gas Corp. 1 Harry L. King "A," 2 miles west of Lipscomb in Section 599, Block 43, H&TC Survey, and 2 miles southeast of Bradford Tonkawa field.

The well flowed 205 bbl. of 42.1°-gravity oil daily on ¼-choke. Perforations were at 7,792 ft.

Arkoma blowout well will be redrilled 400 ft. southwest

The third well in Wilburton field, Latimer County, Southeast Oklahoma, was abandoned after flowing wild for 3½ days. Ambassador Oil Corp. 1 James, C NW 24-5n-18e, blew out at 8,988 ft. in the Spiro sand. Drill-pipe was stuck at 3,200 ft.

Two weeks ago the well flowed more than 75 M.M.c.f.d., taking 7,000 bbl. of 18-lb. mud to kill the gas flow. The Falcon-Seaboard Drilling rig was not damaged. New well location will be 400 ft. southwest of the 1 James try.

Texas' Bee County has Pettus strike

A wildcat nearly a mile northeast of Plummer field, in northern Bee County, Central Texas coastal area, has proved productive from Pettus sand.

Operator is Thomas B. Pearce, of Alice. The well, 1 Maude Martin, was drilled to 3,122 ft. Its Pettus pay is perforated at 3,000-6 ft. Absolute open-flow potential is 2,900 M.c.f.d. of gas. Liquid recovery is a 58°-gravity condensate with a gas-liquid ratio of 330 M.c.f. per bbl.

Location is 4 miles northwest of Mineral.

Louisiana well taps deep pay

DEEP oil production has been opened in Lower Vacherie field, in southeastern St. James Parish, South Louisiana.

Discovery is in Union Texas Natural Gas Corp. 3 Miles Timber Co., which flowed at the rate of 268 bbl. of 43.7° - gravity oil daily through small chokes from 15,158-66 ft. Flowing pressure was 6,900 psi., and gas-oil ratio 683 cu. ft. per bbl.

This is the third productive well but the first oil production for the field. The pay also is the third and deepest.

The other two wells were gas productive from 10,000-ft. and 11,000-ft. sands. Discovery well was completed in 1955. The new producer is 3,000 ft. from it.

California strike opens new reservoir

A new oil reservoir has been opened by Union Oil Co. of California on its 3,270-acre state lease west of Timbalier Bay field, in Timbalier Bay, Lafourche Parish, Coastal Louisiana.

The discovery well, 4 State 3,088, is a joint operation with Louisiana Land & Exploration Co., which holds 40% interest in the block.

Multiple oil and gas-bearing sands were logged in the well from 11,250 ft. to total depth at 14,208 ft. Completion is in a zone at 11,252-57 ft. Flow was gaged at 280 bbl. daily through 9/64-in. choke at pressure of 1,390 psi. Gravity of the oil is 35.1°.

A deeper 73-ft. gas-condensate zone not being produced tested 110 bbl. of liquid daily.

Location of the well is about midway between Timbalier Bay and Caillou Island field, in Terrebonne Parish. Both fields are among South Louisiana's larger fields.

Wider use seen for gas exploder

THE GAS EXPLODER, seismic exploration sound source, will be used more abroad. Under an arrangement with Marine Geophysical International, Inc., of Houston, a French geophysical contractor, Compagnie Generale de Geophysique, Paris, will use the gas exploder in European and North African waters.

This sound source is actually a detonating chamber using a mixture of oxygen and propane in seismic reflection profiling. The shots are repeated at regularly-spaced time intervals, every 2 or 4 seconds, and are triggered at zero time on the seismic records. Reflected signals from each shot are recorded adjacent to each other on the record.

Surveys are made at boat speeds of 3 to 4 m.p.h. and requires a shooting crew of two men. Special geophones varying from one to a large array are used as detectors.

Two types of gas-gun systems have been used in this method. The system consists of two guns 3 ft. long and 4 in. inside diameter with the ends of the barrels extending beneath the water surface. Both guns are fired simultaneously as they are towed behind the boat.

The records are taken with a filter-pass band of 30-60 c.p.s.

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Depth of continuous reflections obtained by the exploder are 4,000 to 6,000 ft. below the water bottom.

The second type of gun consists of three smaller open cylinders fired at a continuous rate of a shot every 2 seconds. These barrels are 1½ ft. long and 2 in. inside diameter. The resulting sound waves received are a band pass filter setting of 50-90 c.p.s. and effective depth is 2,000-3,000 ft. below the water floor. The smaller guns are particularly useful in areas of difficult access.

The low-cost sound sources provided by the gas detonation chamber will be made by Marine and CGG will offer the use of this equipment to its clients.

The French firm also announced that it has acquired key personnel and specialized equipment of SARM, a firm specializing in airborne magnetic surveys and airborne radiometric exploration, and will enter the field of airborne geophysics. SARM recently terminated its activities.

New book covers Houston, gulf area

A nontechnical volume on the geology of the Houston and Gulf Coast area has been published by the Houston Geological Society.

It was prepared by the society's Academic and Library Committee, and entitled "Geology of Houston and Vicinity, Texas." It was designed primarily as an aid in the teaching of elementary geology in the Houston area.

The need for such a volume became acute, according to George C. Hardin, Jr., president of the society, when the Texas State Board of Education, in 1959, added to its "Proposed Standards for Texas Secondary Schools" a course entitled "Earth Science" for Grades 7 or 8, and a one-semester elective science course in geology, meteorology, oceanography, and astrophysics for Grades 10 through 12.

Principal subjects are covered under the general headings of "Scenery and Recent Sediments Along the Gulf Coast," "Surface Geology in and Near Houston," "Subsurface Geology," and "Economic Geology."

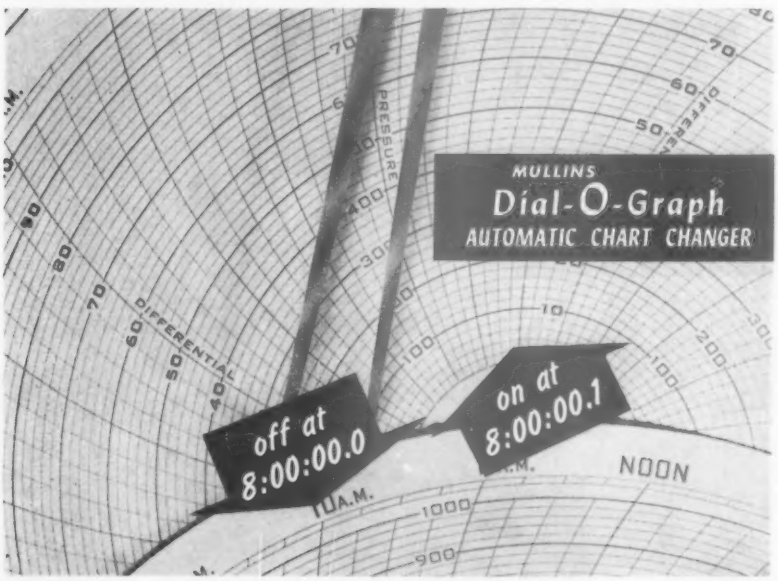
In addition, the volume contains "Notes on Selected Fossil Localities in Eastern Texas," and "Notes on the Geological History of the Llano Region of Texas," and "Guide to Selected Rock and Mineral Localities."

Texas atlas to be completed

A geologic atlas of Texas will be compiled by the University of Texas Bureau of Economic Geology as a new research project supported by $41,400 in contributions from oil companies and professional geological societies in the state.

The maps will show geology, topography, and roads, and will be valuable for engineering and agricultural studies and geophysical and geologic projects.

The new map project will involve compilation of 37 sheets on a scale of 4 miles to the inch. Each sheet will be 22 by 38 in. in size and will encompass an area of 1° of latitude by 2° of longitude. The 37 sheets will be published individually and distributed as completed. The Tyler and Palestine areas in East Texas



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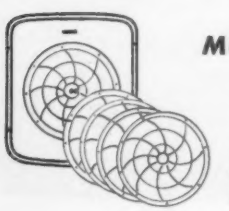

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are the first scheduled for completion.

Dr. Virgil E. Barnes, bureau research scientist and university geology professor, will direct the map project. Dr. Barnes, who has had 31 years of experience as a Texas geologist, will work with oil company geologists and local professional groups.

Production confirmed at gas well in western Oklahoma

The second well in Northeast Trail field, Dewey County, western Oklahoma, confirms the field. It is Humble Oil & Refining Co. 1 Estee, C SW NE 2-17n-19w, southeast offset to the field discovery.

The well flowed 2,800 M.c.f.d. with a spray of condensate during tests of the Oswego at 9,430-76 ft. The discovery well was 1 Willis Barnes in C NW SE 34-18n-19w. That well flowed 1,300 M.c.f.d and 137 bbl. condensate per day from Oswego at 9,315-58 ft.

Blaine County. Pan American Petroleum Corp. got Chester Mississippian lime gas at the 1 Strader unit in C SW NE 5-19n-11w, inside the linkup area of Okeene and Homestead fields, Blaine and Major counties. The well flowed 3,800 M.c.f.d. on ½-in. choke.

Kingfisher report. Activity here continues strong. Wilcox Oil Co. 2 Felder, C SW SE 27-19n-6w, East Hennessey field, flowed 1,187 bbl. of oil per day from open hole in the Meramic lime at 6,850-6,951 ft.; from Oswego the well flowed 1,030 bbl. daily, and Manning 161 bbl. daily.

Hall-Jones Oil Co. 1 Vaverka, C NE SW 17-19n-6w, East Hennessey field, flowed 80 bbl. of oil in 8 hours through 22/64-in. choke.

Morrow discovery finaled in Texas Panhandle area

Morrow gas production is reported at a wildcat in southwestern Ochiltree County in the Texas Panhandle. The discovery well is Sunset International Petroleum Corp. 1 Boese, 9 miles southwest of Perryton in Section 11, Block JT, TWNG Survey.

The well was completed for 5 M.M.c.f.d., absolute open-flow poeastern Lipscomb County flowing 1,037 bbl. of 34.7°-gravity oil per day on 32/64-in. choke. This well produced from Mississippian perforations at 7,944-86 ft. Location is in Section 1155, Block 43, H&TC Survey, 3 miles west of Follett.
tential, natural. Perforations were at 7,828-34 ft.

Big oiler. Amarillo Oil Co. completed 1 Marlin Laubhan in north-

DISCOVERIES

California

San Joaquin County:
Occidental Petroleum Corp. 1 Lathrop unit A, 5-1s-6e, flowed 16,119 M.c.f.d. from selected perforations in Upper Cretaceous E zone between 7,230-7,642 ft. Discovery well in Lathrop field.

Santa Barbara County:
Richfield Oil Corp.-Honolulu Oil Corp.-Signal Oil & Gas Co. State 308-3, 36-4n-29w. No-dope hole drilled to TD 6,105 ft. off Santa Barbara County near Coal Oil Point. Reportedly a gas discovery.

Colorado

Washington County:
Plains Exploration Co. 1 Challis Farms Inc., C NE NW 31-1n-53w. IPP 26 BOPD, 70% b.s. and w., "D" sand 4,886-92 ft. TD 5,451 ft. "D" sand discovery, new field.

Weld County:
DeVaughn Oil & Gas Co. 1 Thomas,

WISCONSIN-powered field unit cuts crude-oil gathering costs

pumps 20 bbls./hr., at 500 psi. 6 hrs./day with minimum attention!

GATHERING UNIT transfers crude oil from storage into pipeline gathering system. Wisconsin Engine with clutch take-off assembly is short-belted to H-20 Spec. 5 Roper rotary pump. Skid mounting permits hauling to other sites.

The unit shown is job-engineered to keep your gathering operation "on stream" at the lowest operating and upkeep cost.

For example, you can operate the two-cylinder dual-carburetion Wisconsin on gasoline or natural gas, as conditions warrant. Its high torque prevents stalling under suddenly changing loads.

Stellite-faced exhaust valves and inserts and positive rotators extend valve life up to 500%! And main bearing failure is almost unheard of on a Wisconsin.

Even the pump receives special treatment. It is slowed down to assure trouble-free handling of crude oil at high discharge pressure.

Let us tailor the utility unit you need — powered by dependable Wisconsin Engines, *now 3 to 60 hp!* Write for new Bulletin S-283.

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OWWO OTD 6,570 ft. SE SW 31-7n-58w. IPF 24 BOPD and 200 M.c.f.d., cut 2% b.s. and w., "D" sand 6,459-63 ft. TD 6,570 ft. "D" sand discovery, new field.

Kansas

Ford County:

Mack Oil Co. 1 Butler, 8 miles northeast of Konda pool in SE NE 33-25s-21w. IPP 25 BOPD, plus 9% water, 36.4°, Cherokee 4,715-36 ft. TD 4,881 ft. New oil discovery.

Southwest Texas

Brooks County:

Aluminum Co. of America 1 Mestina Oil & Gas Co., Section 6, La Mestina Grant, A-480, 12 miles northwest of Rachal. IP 1,600 M.c.f.d., absolute open-flow potential, dry gas, shut-in TP 441 psi., perf. 1,050-60 ft. TD 7,115 ft. New reservoir discovery in Alta Mesa area.

Humble Oil & Refining Co. 2 Robert J. Kreberg, Jr., trustee, Section 87, TMRR Sur., A-557, 9 miles northeast of Encino. IP 37 M.M.c.f.d., absolute open-flow potential, GLR 101.7 M.c.f. per bbl., 50.4°, shut-in pressure 2,676 psi., perf. 8,058-62 ft. TD 10,000 ft. Discovery well of West Pita field, between Pita and Tio Ayola field.

Duval County:

L. B. Horn and D. W. Dassow 1-A Garcia, 13 miles northwest of San Diego in Section 407, AB&M Sur., A-37. IP 8,200 M.c.f.d., absolute open-flow potential, dry gas, shut-in TP 589 psi., perf. 1,670-80 ft. TD 5,100 ft. New-field discovery.

Gonzales County:

Harkins & Co. and A. B. Alkek 1 Leila F. Kelley et al., John E. Garvin ¼ League, 10 miles south of Gonzales. IP 3,100 M.c.f.d., absolute open-flow potential, GLR 37,110 cu. ft. per bbl., 40.2°, shut-in TP 4,027 psi., perf. 11,453-90 ft., Edwards. TD 11,785 ft. New Deep-Edwards field.

Jim Hogg County:

Cherosage Enterprises, Inc., et al. 1 Myrtle Draper, Noriecitas Grant, A-356, 2 miles southwest of Hebbronville. IP 16 M.M.c.f.d., absolute open-flow potential, dry gas, perf. 3,493-95 ft., Government Wells sand. TD 3,629 ft. New-field discovery.

Starr County:

Morris Cannan 1 Virginia Guerra, Section 143, AB&M Sur., A-29, 25 miles northeast of Rio Grande City and 5 miles northeast of A & A field. IP 7,700 M.c.f.d., absolute open-flow potential, GLR 115 M.c.f. per bbl., 54.5°, shut-in pressure 1,485 psi., perf. 4,407-10½ ft., Hockley. TD 4,442 ft. New-field discovery.

Zapata County:

Union Producing Co. 18 Jennings, Cerrito Blanco Grant, A-73, 12 miles northeast of Bustamente. IP 28 M.M.c.f.d., absolute open-flow potential, dry gas, shut-in TP 6,505 psi., perf. 9,624-31 ft., Wilcox. TD 15,000 ft. New Deep-Wilcox discovery.

Gulf Oil Corp. 1 Morgan et al., Block 7, J. H. Vermilion Sur. 314, A-205, 6 miles northwest of Randado. IPP 11 BOPD (net), 30% water, 30.6°, perf. 1,827-35 ft. TD 3,707 ft. Wildcat in South Martinez area.

Zavala County:

C. C. Winn 2 Ike T. Pryor, Jr., et al. —Box. IP 1,850 M.c.f.d., absolute open-flow potential, dry gas, shut-in TP 1,410 psi., perf. 3,155-94 ft. TD 3,600 ft. New-field discovery.

W. J. Steeger et al. 1-11 Cross "S" Ranch, Inc., Section 11, Farm Lot 56, Jose de Aguirre Sur., A-2, 7 miles north of Crystal City. IP 4,600 M.c.f.d., absolute open-flow potential, dry gas, shut-in TP pressure 1,384 psi., perf. 3,333-48 ft. San Miguel; and 15 M.M.c.f.d., dry gas, 1,043 psi., perf. 2,918-21 ft., Olmos. TD 3,757 ft. New-field discovery.

Texas Gulf Coast

Brazoria County:

Texkan Oil Co. and Slick Oil Corp. 1-A Clements, Joshua Abbott Sur., 5 miles north of Angleton. IP 32 M.M.c.f.d., absolute open-flow potential, GLR 35,390 cu. ft. per bbl., 54.6°, shut-in TP 3,249 psi., perf. 9,374-78 ft., Frio. TD 10,210 ft. New-pay discovery in East Chenango field.

Calhoun County:

Tidewater Oil Co. 1 Texas State Tract 95, San Antonio Bay, 9½ miles southeast of Austwell. IP 63 BOPD, 10/64-in., 44.6°, GOR 7,063 cu. ft. per bbl., perf. 10,916-23 ft., Frio. TD 12,030 ft. New-field discovery.

Matagorda County:

Robert Mosbacher, Harry Hurt, and Z. W. Falcone 1 Mignon Doman, John Partin Sur., 3 miles northeast of El Maton and 2 miles northeast of El Maton field. Shut-in gas well, ungaged. TD 10,217 ft. New-field discovery.

Refugio County:

Thomas Drilling Corp. et al. 1 J. C. Ermis, Section 35, Bonnie View Ranch Subd., Thomas Antonio Gallan Sur., 5 miles north of Bayside. IP 95.06 BOPD (net), 10% water, P-36 choke, 43°, TP 450 psi., GOR 433 cu. ft. per bbl., perf. 7,024-30 ft., Frio. TD 8,864 ft. New-field discovery.

Texas Panhandle

Lipscomb County:

Shamrock Oil & Gas Corp. 1 Harry L. King "A," 2 miles west of Lipscomb in Sec. 599, Blk. 43, H&TC Sur. IPF 205 BOPD, ¼-in. choke, 42.1°, GOR 2,498:1, TP 275 psi., CP 1,075 psi., Cleveland sand 7,816-54 ft. TD 10,450 ft. New oil discovery.

West Central Texas

Coleman County:

Dalton Moore Engineering Co. et al. 1 W. G. Holcomb, 1½ miles northeast of Silver Valley in Sec. 33, Blk. 2, GH&H Sur. IPP 12 BOPD, 43°, GOR 817:1, Morris sand 2,962-66 ft. TD 2,966 ft. New oil discovery.

Fisher County:

United States Smelting, Refining & Mining Co. 1 Lawlis, 4 miles southeast of Sylvester in Sec. 41, Blk. 1, Cambrian test. IPP 33 BOPD, plus 80% water, 44.6°, Ellenburger 5,972-5,820 ft. TD 6,155 ft. PB 6,076 ft. New oil discovery.

Nolan County:

Jake L. Hamon and Roy Guffey Oil Co. 1 Mary I. Dicson, 6 miles south of Sweetwater in Sec. 87, Blk. 22, T&P Sur. IPF 160 BOPD, 18/64-in. choke, no water, 39°, GOR 400:1, natural, TP 180 psi., Strawn reef 6,056-69 ft. TD 6,793 ft. New oil discovery.

Stonewall County:

East Bissett Strawn field. James G. Brown 1 Leslie Brown, 15 miles north of Aspermont in Sec. 42, Blk. F, H&TC Sur. IPP 157 BOPD, 35.8°, GOR 522:1, Strawn 5,427-29 ft. TD 5,431 ft. New oil discovery.

Old Glory Strawn. Texas Pacific Coal & Oil Co. 6 S. E. May, 7 miles north of Old Glory in J. P. Holder Sur. IPF 206 BOPD, 40/64-in. choke, 40.1°, GOR 410:1, TP 35 psi., CP packer. Strawn sand open hole 5,074 ft. TD 5,080 ft. New oil discovery.

Throckmorton County:

Burk Royalty Co. 1 Killman-Redwine, 2 miles south of Throckmorton in Sec. 283, BBB&C Sur. IPF 91 BOPD, 10/64-in. choke, 42°, GOR 1,000:1, TP 400 psi., CP 800 psi., conglomerate open hole 4,750-86 ft. TD 4,787 ft. New oil discovery.

West Texas

Borden County:

Midwest Oil Corp. 1 L. C. Drum, 16 miles northeast of Gail in Sec. 467, Blk. 97, H&TC Sur. IPF 267 BOPD, plus 6% water, 8/64-in. choke, 39°, GOR 40:1, TP 480 psi., CP packer. Ellenburger 8,374-82 ft. TD 8,389 ft. New oil discovery.

Coke County:

Western Petroleum Co. 1 H. G. Wendland est., 12 miles southeast of Robert Lee in Frederick Merke Sur. 445. IPF 420 BOPD, 18/64-in. choke, 41°, GOR 400:1, TP 320 psi., CP 100 psi., Sevas open hole 3,632-41 ft. TD 3,641 ft. New oil discovery.

Concho County:

Tucker Drilling Co. 1 Cora Henderson, Sec. 43, Blk. 8, H&TC Sur., 10 miles southwest of Eden. IPF 116 BOPD, 38.2°, GOR 658:1, 14/64-in. choke, TP 120 psi., CP packer, Goen lime 4,055-58 ft. TD 4,360 ft. New oil discovery.

Crockett County:

Texas Gulf Producing Co. 1-AA University, 21 miles west of Ozona in Sec. 4, Blk. 33, Univ. Sur. IPCAOF 2,600 M.c.f.d., Strawn and Detrital 8,470-8,564 ft. TD 9,758 ft. New gas discovery.

Ector County:

Metz field. McGrath & Smith 1-C A. B. Connell, 4 miles southwest of Penwell in Sec. 8, Blk. B-16, PSL Sur. IPF 253 BOPD, 20/64-in. choke, 42.7°, GOR 806:1, TP 200 psi., open hole, CP Packer, Ellenburger 9,046 ft. TD 9,090 ft. New oil discovery.

Reagan County:

Phillips Petroleum Co. 1 Hartgrove, 6 miles west of Stiles in Sec. 1, Blk. M, TCRR Sur. IPF 5,200 M.c.f.d., GLR 67,000:1, Devonian 11,084 to 11,252 ft. TD 11,596 ft. New gas-condensate discovery.

Runnels County:

Karl Hoblitzelle 1-G J. B. Herring, OWWO. 6½ miles southeast of Norton in Sec. 34, H. C. Wiley Sur. IPP 48 BOPD, 42°, GOR 260:1, plus water, Palo Pinto lime 3,663-68 ft. TD 4,370 ft. New oil discovery.

Schleicher County:

Ashmun & Hilliard 5 Ltd., et al. 1 A. T. Chaney, 13 miles northwest of Fort McKavitt in Sec. 39, Blk. 8, TW&NG Sur. IPF 45 BOPD, plus 7% water, 28/64-in. choke, 36.8°, GOR 467:1, TP 150 psi., CP 850 psi., Harkey sand 4,196-4,200 ft. and 4,207-13 ft. TD 4,800 ft. New oil discovery.

Ward County, South Pyote field:

T. F. Hodge 3 Edwards Lumber Co., 6 miles south of Pyote in Sec. 99, Blk. 34, H&TC Sur. IPF 171 BOPD, 8/64-in. choke, 40.1°, GOR 950:1, TP 800 psi., CP 1,260 psi., 6,123-43 ft.; IPF 154 BOPD, 18/64-in. choke, 39.5°, GOR 1,320:1, TP 580 psi., CP packer, 6,216-28 ft. TD 6,621 ft. Dual oil discovery, new pay for field.

PROFILE

Richard A. Morse . . . Selling ability comes in handy.

Oil needs better public image

. . . says SPE president-elect Morse. One of his goals is to show people that oil industry hasn't lost its vigor.

LEARNING to sell isn't a job for salesmen only.

At least that's the sentiment expressed by Richard A. Morse, president-elect of the Society of Petroleum Engineers of AIME. Morse is out to improve the oil industry's public image.

Morse, who assumes the presidency of the petroleum engineering group next February, is associate director of research on oil and gas production and transportation for Gulf Research & Development Co., Pittsburgh, Pa. That job involves some selling, too.

Before his election to SPE's highest office, Morse served as vice president (1960) and has been chairman of the Publications Committee and the Technology Committee.

His goal. As SPE president in 1962, Morse says he hopes to help change the industry image that is prevalent now. In the eyes of a lot of people, the industry is dead. "And that just isn't the case. We've had our ups and downs, sure, but we're in good shape, and we need to make people realize this," says Morse.

One of the most popular sessions at the recent annual SPE meeting in Dallas was a discussion on petroleum engineering colleges and their graduates (OGJ, Oct. 16, p. 72). Morse feels the schools are doing a creditable job, but the oil-industry image is scaring away some of the better students. They are heading for the more glamorous industries, Morse says. And the cause of all this is the current industry shakedown.

"We are trying to get rid of some of the fat that has built up over the last several years, and it is giving the industry a black eye. The shakedown hasn't been handled in a nice, quiet manner, but rather through a crash program. We're trying to undo several years damage in a few short months."

Today's engineering graduates seem to have the wrong attitude toward employment," according to Morse.

"They expect to be vice presidents right away — probably because of some of our hasty hard-sell recruiting that we have used in the past. So young engineers are not content to get out in the field and learn the business from the ground up. When I got out of school, all new engineers were put to work as roustabouts, if they could get a job at all, and they were happy."

His role with Gulf. Morse assumed his present position with Gulf in 1955 after 8 years with Pan American Petroleum Corp. A native of Independence, Kans., Morse got his BS in petroleum engineering from Oklahoma University, and his MS and PhD from Pennsylvania State University.

"My biggest job at Gulf is to sell research in the oil fields," says Morse. New methods and techniques are worthless if research people can't sell them to field men. There is a natural reluctance to try new things because "we've never done it that-a-way before," Morse says, and it's up to research men to develop a hard-sell campaign to put new-found knowledge to work in the field.

"We are like the old farmer," Morse says, "not farming as well as we know how. We aren't achieving maximum utilization of our research.

"We recently visited some of our field offices with a slide show and talk on the use of our walnut-shell propping agent for high-capacity fractures," Morse went on.

"It was a good show, with lots of color in the slides, and was presented in a simple, down-to-earth manner. The subject matter was received with enthusiasm, and we were asked why this information hadn't been made available before. Actually this material had been released to these same offices more than a year earlier, in a formal report. It took good presentation to sell this idea to our operating people."

●

Jack West, district geologist for Signal Oil & Gas Co. in Bakersfield, Calif., has been transferred to Los Angeles. The Bakersfield office has been closed and San Joaquin Valley

PERSONALS

exploration activities will be handled from Los Angeles. **Bob Herron,** geologist in Bakersfield, will also move to Los Angeles.

W. W. Simpson, manager of lands and leases for Skelly Oil Co., has been elected vice president of exploration. Also, **James E. Hara,** vice president and assistant to president, has been elected a director of the company. Hara succeeds **J. W. Vaiden,** senior vice president, who will retire early next year. Simpson was manager of Skelly's southern and Canadian divisions before becoming lands and lease manager in March. Hara, who joined Skelly's legal staff in 1948, has been a vice president since 1960.

SIMPSON

C. D. Weimer has retired from Gulf Oil Corp.'s general tax department, where he has been specialist in federal oil and gas taxation and ad valorem problems. Weimer had been with Gulf for 33 years. He plans to open offices in Pittsburgh to practice tax planning and investment management.

Meyer Luskin, a director of Southern California Petroleum Corp., has been named president and chairman of the company. Luskin has been a director since 1959.

Dr. John F. Horner has been named assistant manager of general engineering in American Oil Co.'s manufacturing department. He will be in charge of process engineering. Horner has been director of process design and economics in the Whiting, Ind., laboratory research and development department. At Whiting, **Hans R. Rall** has retired as head engineer in engineering and technical - service administration. **Louis E. Green** has been advanced to senior research scientist. **Emil M. Banas** and **Cecil G. Brannen** have been named senior project chemists, and **James E. Pitrak** has been named project engineer.

Albert E. Johnson, geologist with Humble, has been transferred to New Orleans from Shawnee, Okla.

Harry E. Fritz, geologist with Gulf Oil Corp., has been transferred to Oneonta, N. Y., from Charleston, W. Va.

Thomas R. Whited, Mobil Oil Co.'s area manager in San Antonio since 1959, has been transferred to Oklahoma City in the same capacity.

Scott Petty, Jr., has been named assistant to the president of the Petty Geophysical Group, San Antonio, Tex.

Dean Trantham, division production superintendent for Kingwood Oil Co., has been transferred to Mount Vernon, Ill., from Salem, Ill.

Robert Schaffer has joined American Oil Co.'s research - laboratory staff in Whiting, Ind. Schaffer has a PhD in chemistry and will do research on instrumental methods of chemical analysis.

Raymond J. Pikna has been named manager of Firestone Tire & Rubber Co.'s new synthetic rubber plant at Port Jerome, France. **Charles H. Hammond** has been named production manager. Pikna had been research engineer in Akron and assistant project engineer for construction of the company's Orange, Tex., synthetic rubber plant. Hammond was manager of the chemical pilot plant in Akron. The Port Jerome plant will be completed late this year.

PIKNA

C. H. Plomteaux, manager of Shell Chemical Co.'s Shell Point plant, Pittsburg, Calif., has been named manager of both the Shell Point and Ventura, Calif., plants. He will continue to headquarter in Pittsburg. **F. D. Kuenzly,** manager of the Ventura plant, has been named ammonia division operations manager. He succeeds **F. A. Horsley,** who has been named division development manager.

C. R. Summers, Jr., has been named director of product-quality coordination in the refining department of Gulf Oil Corp.'s Pittsburgh headquarters. He succeeds the late A. S. Orr. Summers had been technical associate in Gulf Research & Development Co.'s Harmarville, Pa., laboratory, and was also assistant manager of the refinery technology laboratory in Philadelphia for several years. He has been with Gulf since 1926.

SUMMERS

David W. Young, research associate for Sinclair Research, Inc., has received the merit award of Chicago Technical Societies Council. The award recognizes civic contributions and scientific and technical achievements.

C. M. Martin, senior land man for Gulf Oil Corp. in Shreveport, La., has been transferred to Jackson, Miss., in the same capacity.

Paul F. Newton has been promoted to chief petroleum engineer for Plymouth Oil Co. He will headquarter in Houston.

M. A. Pyeatt, Abilene, Tex., district superintendent for General American Oil Co. of Texas, has been transferred to Gladewater, Tex., in the same capacity.

Charlton H. Lyons, Sr., Shreveport, La., is senior partner of Lyons Petroleum, new exploration and production firm with offices in Shreveport and Lafayette, La. Other partners are **C. H. Lyons, Jr.,** executive head of the company; **E. L. Hilliard,** South Louisiana manager; **Hall M. Lyons,** in charge of South Louisiana leasing; **G. F. Abendroth,** in charge of drilling, production, and engineering; **John T. Palmer,** chief geologist; and **J. A. Dykes,** Shreveport district exploration manager. The partners were formerly with Lyons & Logan, independent oil and gas firm. **Gene M. Griswold,** formerly with Humble, has joined Lyons as counsel. **Charles A. Barton,** chief geologist with Placid Oil Co., has joined the new firm as South Louisiana geologist in Lafayette.

Stanley C. Harrison, Tenneco Oil Co. geologist, has transferred from Roswell, N. M., to Midland, Tex.

Walter D. Hodgeson, who had been with Shell Development Co. research laboratory, has joined Sinclair Oil & Gas Co. at Oklahoma City.

Robert A. Greenkorn and **Calvin C. Mattax** have been named research associates in the production division of Jersey Production Research Co., Tulsa.

Carl E. Youngren, Calgary, and **Leslie W. Andrews,** Denver, have been appointed resident geologists under Lion Oil Co.'s scientific advancement plan. Youngren has been district geologist in Calgary for L-M Oil Co., Ltd., an affiliate, and Andrews has been senior geologist in the Denver district.

YOUNGREN

ANDREWS

John W. Laibe, manager of Enjay Chemical Co.'s New York-New England sales district, has been named manager of the chemical raw-materials division. He succeeds **E. W. Bowerman,** who has returned to Humble's Baytown, Tex., refinery after a year's assignment with Enjay. **A. H. Pflugh** will succeed Laibe. **H. L. Snyder** will succeed Pflugh as assistant manager of the New York-New England district.

Roy Spratt, plant superintendent for Northern Natural Gas Co. in Palmyra, Neb., has moved to Clifton, Kans., to succeed **Dewey Rice** as superintendent of operations there. Rice will retire November 1 after 30 years with the company. **Dale Kullbom** will succeed Spratt in Palmyra and **Eutah York** will succeed Kullbom as plant superintendent in Hugoton, Kans. York had been plant superintendent in Holcomb, Kans. He will be succeeded there by **John Scoville,** compressor and processing plants superintendent in Spearman, Tex. **C. M. Floyd,** superintendent of operations in Garden City, Kans., will succeed Scoville in Spearman. **Harold Carr,** district pipeline superintendent in Ogden, Iowa, will succeed Floyd in Garden City. **Irvin Webb,** district pipeline superintendent in Garden City, will succeed Carr in Ogden.

Laurence E. Hanna, assistant chief engineer in Panhandle Eastern Pipe Line Co.'s engineering division, has been appointed assistant to Vice President **Fred H. Robinson.** He will headquarter in New York.

Walter Dulany, district superintendent for Cities Service Pipe Line Co. in El Dorado, Kans., has retired after 44 years with the company.

Fred E. Robertson, area supervisor for Texas Pipeline Co. in Houston, has been promoted to Hearne products division superintendent in Hearne, Tex.

John E. (Jack) Johnson, mechanical engineer for Laurel Pipe Line Co., has been named products movement supervisor.

C. H. Lucas, senior foreman in the Waco, Tex., district of Lone Star Gas Co.'s pipeline department, has been named Waco district superintendent. He succeeds **Eldon Glenn,** who has retired. **W. H. McDaniel,** senior foreman in the Vernon, Tex., district, has succeeded Lucas in Waco. **Paul Muntz** replaced McDaniel.

Arthur E. McElroy, division engineer for El Paso Natural Gas Co., has been named assistant superintendent of the northwest transmission division, a new position. **John M. Viehweg,** senior engineer, will succeed McElroy as division engineer.

Dan M. Krausse, senior vice president of Cosden Petroleum Corp., will leave Cosden in mid-November after 12 years with the company. He plans to join Dresser Industries, Inc., in Dallas as a vice president. He will work with the Dresser companies related to oil and gas drilling equipment and services. Krausse has been a senior vice president and head of Cosden's refining and chemical division since 1957.

W. Jess Price, manager of European operations for Loffland Brothers Co., Tulsa, has been elected vice president and general manager, Eastern Hemisphere. Price will continue to headquarter in The Hague. **J. Wayne Burris,** superintendent of operations for Loffland in Bengasi, Libya, has been named assistant general manager, Eastern Hemisphere. He will continue to headquarter in Bengasi. **John M. Reynolds** has been named chief engineer, Eastern Hemisphere, with headquarters in Bengasi. **John D. Underwood,** contract representative in Maracaibo, Venezuela, has been moved to domestic operations as contract manager of the Rocky Mountain division. He will headquarter in Denver.

PRICE

E. R. Osburn, Jackson, Miss., district geologist for United Producing Co., has been transferred to Houston.

James H. Borgerding, reservoir engineer with Texaco, has been transferred to Casper, Wyo., from Denver.

Donald C. Duncan has resigned as district geologist for Freeport Oil Co. in New Orleans to join H. W. Bass & Sons, Inc., as district geologist in the new Louisiana Gulf exploration office, New Orleans.

Charles A. Betzel, manager of laboratories for Petroleum Technologists, Inc., has been elected vice president and general manager of the company. He will headquarter in Dallas.

E. Burt Arey, Atlanta division retail sales manager for Shell Oil Co., has been named district sales manager in Atlanta. He succeeds **Lester L. Kelly,** who has retired.

Herbert J. Leimbach, Jr., supervisor of Atlantic Refining Co.'s contracting and coordinating section in Philadelphia, has been named manager of the construction division in the engineering and construction department.

Edward R. Kendrigan, division manager of operations and engineering in Tidewater Oil Co.'s marketing department, has been named administrative assistant to the eastern division general manager. Kendrigan has been with Tidewater since 1934. He served as northern New York area operating supervisor and New York district engineer before becoming division operations and engineering manager in 1957.

Marvin P. Breiner, mechanical engineer, has joined maintenance department at Monsanto Chemical Co. Queeny plant, St. Louis, after serving with Standard Oil Co. of California in San Francisco.

J. V. Riner, exploitation engineer in Shell Oil Co.'s Houston division, has been named reservoir engineer. **K. W. Bunte,** mechanical engineer in Quitman, Tex., has been transferred to the Houston division.

N. R. Neblett, Washington marketing division manager for American Oil Co., has been named district manager for the metropolitan Kansas City area. He succeeds **R. V. Ware,** who has been transferred to Cleveland.

Dr. Rudolf Martin has retired from Shell Oil Co. of Canada in Calgary after 25 years with the Royal Dutch-Shell companies in Colombia, Venezuela, Indonesia, the Netherlands, U. S., and Canada. Martin plans to open offices as consulting geologist in Calgary. He came to Calgary in 1955 as area production geologist. Since 1959 he has been in charge of special studies.

J. G. K. Strathy, an officer of Dominion Securities Corp., Ltd., Toronto, and **F. R. Matthews,** partner in Allen, MacKimmie, Matthews, Wood, Phillips & Smith, Calgary, are slated to become directors of the new Murphy Oil Co., Ltd. The proposed new company, to be formed by merger of Amurex Oil Co. and Murphy-Canada Oil Co., is subject to stockholder approval of both companies December 11.

C. B. McGranahan, engineer with Offshore Co. in Baton Rouge, La., has joined Phillips Petroleum Co. as production engineer in Odessa, Tex.

Leonard A. Milligan, district land man for Cities Service Petroleum Co. in Oklahoma City, has been transferred to Midland, Tex., in the same capacity.

Jerrell P. Baggett has been named vice president of Dixon Drilling Co., Abilene, Tex. He will continue as drilling superintendent of the firm. Baggett joined Dixon last year.

Sir Harold Snow will retire as deputy chairman and managing director of British Petroleum Co., Ltd., at the end of the year. He will continue as a director of the company.

Ben H. Caudle and **Allen M. Rowe, Jr.,** have joined the staff of Texas Petroleum Research Committee at the University of Texas. Caudle was formerly with Atlantic Refining Co. in Dallas and Rowe was with Jersey Production Research Co. in Tulsa.

Ben C. Hayton, manager of glycol products in Jefferson Chemical Co.'s Houston headquarters, has been named assistant sales manager of the company. He will headquarter in New York and will be responsible for sales in the eastern region and Canada and will act as liaison with Jefferson's parent companies, American Cyanamid Co. and Texaco. **K. L. VanderVoort,** New York district manager, has been promoted to eastern regional manager.

Bob Buford has joined Murfin Drilling Co., Wichita, as contract representative.

Lealon L. Sargent, geologist with Tenneco Oil Co. in Wichita, has been transferred to Denver in the same capacity.

Royce Kline, central division assistant sales manager for Frontier Refining Co., Denver, has been promoted to manager of the western sales division.

William S. Halcomb, Jr., assistant supervisor of gas purchases for Transcontinental Gas Pipeline Corp., has joined Ocean Drilling & Exploration Co. of New Orleans as manager of the land division.

Kenneth Grandall, independent oil and gas consultant, has joined H. Zinder & Associates, Inc., engineering, economic, and management consultants, as chief petroleum engineer. He will headquarter in Houston.

New members of Oklahoma Petroleum Council's executive committee include **W. B. Berwald,** Ohio Oil Co., Tulsa; **Cecil H. Frey,** Skelly Oil Co., Tulsa; **J. E. Low,** Amerada Petroleum Corp., Tulsa; and **Robert D. Phillips,** Pemco Oil Co., Tulsa.

W. A. Murray, general manager of Lago Oil & Transport, Ltd., an affiliate of Standard Oil Co. (N. J.), has been named president of Lago. He succeeds **Odis Mingus,** who has retired after 31 years with Lago. **F. Clark Donovan,** a director of Lago, will succeed Murray as general manager.

DEATHS

William B. Way, 76, long-time manager of International Petroleum Exposition, Tulsa, died October 16 at his home in Tulsa of an apparent heart attack. Way became IPE general manager in 1929 and served through the last exposition in 1959.

Benjamin F. Tipton, 71, retired Service Pipe Line Co. dispatcher, died October 15 in a Tulsa hospital after a short illness. Tipton retired in 1955.

Ray Carlton Shibe, 68, retired vice president of Wilshire Oil Co., died October 9 at his home in Brentwood, Calif., after a short illness. Shibe, who also served as secretary-treasurer of Wilshire, had been with the company 25 years.

Guy G. Fisher, 76, Evansville, Ind., independent operator, died October 11 after a long illness.

L. L. Welker, Evansville, Ind., independent operator, died October 5 in an Evansville hospital after a month's illness.

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To the company treasurer: How about a Savings Bond bonus for the company, too? Invest surplus funds in Series "E" and "H" Bonds. Each has an annual limit of $10,000 face value. Bonds are safe and sure. Their value is guaranteed. They don't fluctuate with the market. Both yield 3¾%, when held to maturity.

20th ANNIVERSARY 1941 1961

U.S. SAVINGS BONDS

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Statistics

Wells and footage drilled, by depth classification

(Footage in thousands of feet)

		Under 1,250	1,250-2,500	2,500-3,750	3,750-5,000	5,000-7,500	7,500-10,000	10,000-12,500	12,500-15,000	Over 15,000	Total
1952	Wells	4,620	9,581	11,536	6,830	8,033	3,526	1,354	331	10	45,821
	(% of U. S.)	10.08	20.91	25.18	14.91	17.53	7.70	2.95	0.72	0.02	100.00
	Footage	4,184	17,115	36,216	29,633	49,153	30,213	15,938	4,568	170	187,190
	(% of U. S.)	2.24	9.14	19.35	15.83	26.26	16.14	8.51	2.44	0.09	100.00
1953	Wells	4,951	10,270	12,598	7,447	8,686	3,508	1,379	408	32	49,279
	(% of U. S.)	10.05	20.84	25.56	15.11	17.63	7.12	2.80	0.83	0.06	100.00
	Footage	4,394	17,981	39,171	32,049	52,906	29,982	16,194	5,618	544	198,839
	(% of U. S.)	2.21	9.04	19.70	16.12	26.61	15.08	8.14	2.83	0.27	100.00
1954	Wells	5,570	11,552	13,253	7,834	9,733	3,838	1,520	581	49	53,930
	(% of U. S.)	10.33	21.42	24.57	14.53	18.05	7.11	2.82	1.08	0.09	100.00
	Footage	4,943	20,226	41,242	33,743	59,343	32,800	17,854	8,002	833	218,986
	(% of U. S.)	2.26	9.24	18.83	15.41	27.10	14.98	8.15	3.65	0.38	100.00
1955	Wells	5,181	13,705	14,679	8,012	8,741	3,948	1,642	675	99	56,682
	(% of U. S.)	9.15	24.18	25.90	14.13	15.42	6.96	2.90	1.19	0.17	100.00
	Footage	4,067	24,532	45,329	35,173	53,189	33,700	19,278	9,319	1,683	226,270
	(% of U. S.)	1.80	10.84	20.03	15.55	23.51	14.89	8.52	4.12	0.74	100.00
1956	Wells	5,585	14,174	14,169	8,942	8,526	4,129	1,678	815	142	58,160
	(% of U. S.)	9.60	24.37	24.36	15.38	14.66	7.10	2.89	1.40	0.24	100.00
	Footage	4,468	25,513	43,924	39,345	52,009	35,261	19,716	11,252	2,414	233,902
	(% of U. S.)	1.91	10.91	18.78	16.82	22.24	15.07	8.43	4.81	1.03	100.00
1957	Wells	6,347	12,257	13,463	7,770	8,703	3,769	1,817	739	159	55,024
	(% of U. S.)	11.53	22.28	24.47	14.12	15.82	6.85	3.30	1.34	0.29	100.00
	Footage	5,230	22,063	41,735	34,266	53,218	32,187	21,350	10,309	2,729	223,087
	(% of U. S.)	2.34	9.89	18.71	15.36	23.86	14.43	9.57	4.62	1.22	100.00
1958	Wells	6,950	11,015	12,116	6,290	7,777	3,316	1,727	663	185	50,039
	(% of U. S.)	13.89	22.01	24.21	12.57	15.54	6.63	3.45	1.33	0.37	100.00
	Footage	5,055	19,607	37,317	27,643	47,556	28,319	20,292	9,249	3,186	198,224
	(% of U. S.)	2.55	9.89	18.83	13.94	23.99	14.29	10.24	4.66	1.61	100.00
1959	Wells	7,869	10,673	11,762	6,775	8,076	3,642	1,954	801	212	51,764
	(% of U. S.)	15.20	20.62	22.72	13.09	15.60	7.04	3.77	1.55	0.41	100.00
	Footage	5,943	18,998	36,227	29,776	49,385	31,103	22,960	11,174	3,665	209,231
	(% of U. S.)	2.84	9.08	17.32	14.23	23.60	14.87	10.97	5.34	1.75	100.00
1960	Wells	7,328	10,032	9,345	6,464	7,119	3,407	2,137	697	222	46,751
	(% of U. S.)	15.67	21.46	19.99	13.83	15.23	7.29	4.57	1.49	0.47	100.00
	Footage	5,275	17,860	28,763	28,409	43,533	29,095	24,362	9,568	3,838	190,703
	(% of U. S.)	2.77	9.36	15.08	14.90	22.83	15.26	12.77	5.02	2.01	100.00

Drilling-depth patterns are changing

THE AVERAGE well drilled in 1960 was 6 ft. shallower than the average well completed in 1952 but there were some very important changes in the distribution of drilling by depth classifications.

Depth has a phenomenal effect on drilling cost. The joint drilling cost study (OGJ, Mar. 13, 1961, p. 81) showed that the average well below 15,000 ft. was about 21 times as deep as wells in the 0-1,250-ft. range but cost 109 times as much to drill.

The table above gives a breakdown of wells and footage by depth classification for the 9-year period 1952-60. Totals include service wells which were excluded from the cost studies.

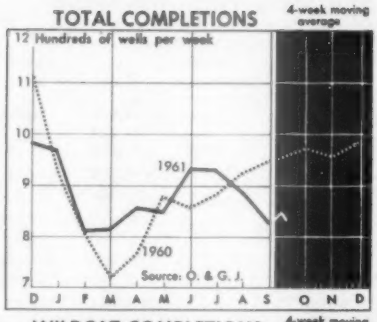
Footage totals for various depth classifications have been calculated from averages, adjusted by samples from the cost studies and from original well reports.

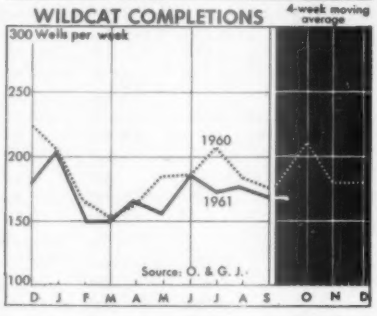
These data will be charted in next week's Journal to show how the trends influence average depth and drilling costs.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,160,485	UP	37,435	UP	191,843
Crude stocks	249,957,000	DOWN	2,025,000	UP	19,969,000
Completions	812	DOWN	125	DOWN	123
Refinery runs	8,324,000	UP	169,000	UP	426,000
Gasoline stocks	185,741,000	UP	631,000	DOWN	2,418,000
Kerosine stocks	36,329,000	UP	64,000	UP	342,000
Distillate stocks	170,419,000	UP	3,981,000	DOWN	4,647,000
Residual stocks	49,982,000	DOWN	98,000	DOWN	1,445,000
Four-product stocks	442,471,000	UP	4,578,000	DOWN	8,168,000
Total imports	2,102,400	UP	*589,600	UP	493,800

*Data for 10-6 revised.





Active rotary rigs

	10-16-61	10-9-61	10-17-60
Alabama	5	3	2
Alaska	9	13	7
Arkansas	18	16	13
Arizona	3	2	2
California	94	97	71
Land	87	93	68
Offshore	7	4	3
Colorado	18	31	58
Florida	1	1	3
Land	0	0	2
Offshore	1	1	1
Georgia	0	0	1
Illinois	49	51	52
Indiana	8	10	8
Iowa	1	1	1
Kansas	108	109	113
Kentucky	8	7	5
Louisiana	285	268	262
North	47	34	26
S. Inland waters	102	109	98
S. Land	82	78	81
Offshore	54	47	57
Michigan	23	27	31
Mississippi	64	63	60
Missouri	2	2	1
Montana	19	18	19
Nebraska	21	23	25
Nevada	1	1	0
New Mexico	102	101	105
New York	2	2	2
North Carolina	1	1	0
North Dakota	12	12	17
Ohio	5	6	4
Oklahoma	183	204	170
Oregon	0	0	1
Pennsylvania	10	11	8
Tennessee	1	1	0
Texas	629	653	594
S. Inland waters	11	5	5
S. Land	169	195	163
Offshore	0	1	1
North	62	61	42
Panhandle	53	58	44
East	67	62	59
West Central	155	161	168
West	112	110	112
Utah	45	44	27
Washington	0	0	1
West Virginia	12	11	6
Wisconsin	0	1	0
Wyoming	58	58	68
Total U. S.	1,797	1,848	1,737
Cum. avg. to date	1,724	1,722	1,735
Western Canada	150	170	157
Eastern Canada	1	0	1
Grand Total	1,948	2,018	1,895

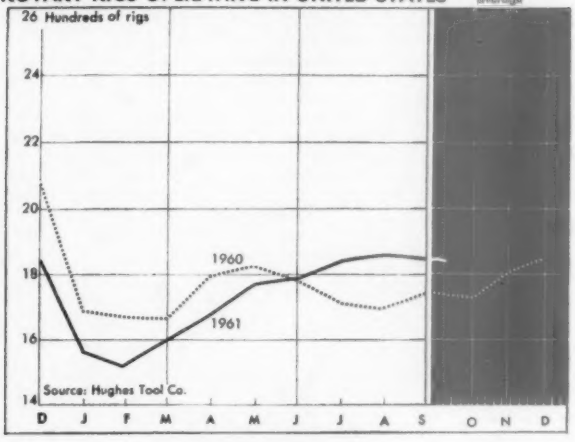
Hughes Tool Co. report.

Weekly well completions . . . Week ended October 14, 1961

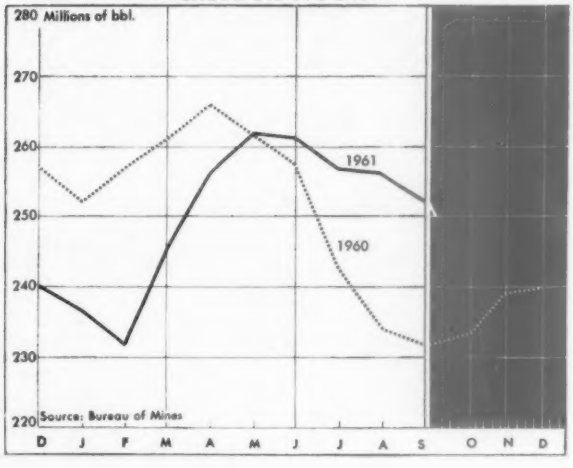
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Alabama	0	0	0	0	0	0	0	32	36	0	0	0	0	0	8	
Alaska	2	1	0	0	1	0	22,785	35		0	0	0	0	0	8	
Appalachian	33	4	0	23	6	0	79,964	1,668	1,429	6	0	0	3	3	62	55
Arizona	0	0	0	0	0	0	0	19	28	0	0	0	0	0	11	18
Arkansas	12	4	0	0	8	0	37,948	401	471	3	0	0	0	3	85	126
California	42	31	0	3	8	0	160,596	1,376	1,295	6	0	0	0	6	212	244
Colorado	7	1	0	0	6	0	31,792	491	499	4	0	0	0	4	229	255
Illinois	36	18	0	2	16	0	88,614	1,554	1,795	10	3	0	0	7	356	380
Indiana	20	5	0	0	15	0	29,251	584	833	5	0	0	0	5	156	304
Kansas	55	28	0	2	25	0	201,365	3,862	3,111	9	0	0	0	9	709	835
Kentucky	23	8	0	0	15	0	27,925	1,478	1,656	1	0	0	0	1	100	156
Louisiana	69	24	7	7	31	0	465,925	2,979	2,810	16	0	2	1	13	497	432
North	37	9	0	6	22	0	125,204	1,240	1,064	11	0	0	0	11	232	210
South	29	13	7	1	8	0	306,805	1,306	1,357	5	0	2	1	2	221	196
Offshore	3	2	0	0	1	0	33,916	433	389	0	0	0	0	0	44	26
Michigan	17	7	0	1	9	0	59,149	610	740	8	1	0	0	7	225	197
Mississippi	12	6	0	0	6	0	110,743	424	537	3	0	0	0	3	150	207
Montana	18	9	0	0	9	0	80,512	314	258	9	1	0	0	8	149	122
Nebraska	23	9	0	0	14	0	99,098	779	692	9	0	0	0	9	382	290
New Mexico	38	21	0	9	8	0	207,423	1,419	1,490	7	3	0	0	4	232	212
West	13	1	0	9	3	0	64,319	618	533	4	1	0	0	3	75	59
East	25	20	0	0	5	0	143,104	801	957	3	2	0	0	1	157	153
North Dakota	6	2	0	0	4	0	35,297	203	237	3	0	0	0	3	54	64
Ohio	28	12	0	6	7	3	76,780	818	840	1	0	0	1	0	35	40
Oklahoma	98	55	0	9	28	6	311,681	4,511	3,572	8	1	0	0	7	436	573
Texas	248	148	0	22	74	4	1,173,656	11,323	12,392	57	8	0	6	43	2,403	2,551
District 1	15	7	0	0	8	0	27,801	714	871	6	0	0	0	6	295	324
District 2	15	3	0	7	5	0	127,887	601	603	6	1	0	2	3	175	150
District 3	18	13	0	0	5	0	108,407	893	941	2	0	0	0	2	173	177
District 4	28	6	0	4	18	0	171,778	943	855	15	1	0	3	11	245	238
East	17	11	0	1	5	0	109,089	925	1,008	5	0	0	0	5	241	207
District 7-B	26	13	0	3	10	0	71,184	1,421	1,782	7	2	0	1	4	395	507
West	74	60	0	1	11	2	360,149	2,832	3,205	7	1	0	0	6	563	495
District 9	40	26	0	2	10	2	119,900	2,072	2,306	7	2	0	0	5	221	406
District 10	15	9	0	4	2	0	77,461	922	821	2	1	0	0	1	95	47
Utah	4	2	0	0	2	0	18,791	190	184	2	0	0	0	2	87	68
Wyoming	20	6	0	3	11	0	86,514	764	815	10	0	0	1	9	290	329
Misc. (Fla.)	1	0	0	0	1	0	7,871	150	135	1	0	0	0	1	146	114
Total U. S.	812	401	7	87	304	13	3,413,680	35,984	35,855	178	17	2	12	147	7,022	7,574
Prev. week	937	421	18	119	325	54	3,891,724			184	11	6	10	157		
Cum. 1961	35,984	16,153	698	3,616	13,057	2,460	146,139,103			7,022	627	77	315	6,003		
Cum. 1960	35,855	16,199	1,044	2,963	13,698	1,951	149,406,350			7,574	675	81	260	6,558		
Western Canada	52	29	0	11	12	0	309,726	1,789	1,813	14	4	0	3	7	429	481

Production

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



Crude-oil stocks by states of origin*

(Thousands of barrels)

	10-7-61	9-30-61	10-8-60
Pennsylvania	2,307	2,319	2,323
Other Appalachian	1,398	1,458	1,449
Illinois, Indiana, Michigan	10,191	10,170	8,972
Nebraska and North Dakota	3,514	3,206	2,825
Kansas	8,596	8,665	8,197
Oklahoma	16,309	16,231	14,926
Arkansas	1,580	1,555	1,790
Louisiana	20,583	20,340	18,209
North	3,301	3,385	2,967
South	17,282	16,955	15,242
Mississippi, Alabama, Florida	3,608	3,637	1,845
New Mexico	9,273	9,190	8,361
Texas	107,908	108,862	96,584
East Texas	8,236	8,346	7,691
West Texas	48,063	48,765	47,544
Texas Gulf	19,451	19,740	16,441
Other Texas	32,158	32,011	24,908
Wyoming	16,284	16,483	15,244
Other Rocky Mountain	9,967	10,073	9,656
California	24,535	23,696	26,159
Foreign	†13,904	16,097	13,448
Total	**249,957**	251,982	229,988

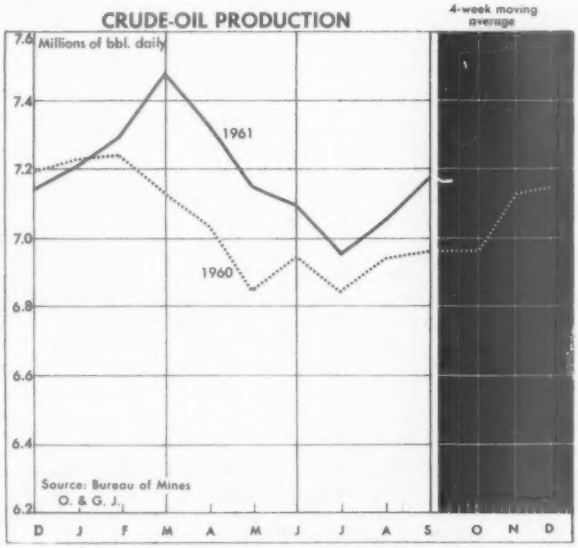
*Bureau of Mines. †Includes 3,393,000 bbl. in California.

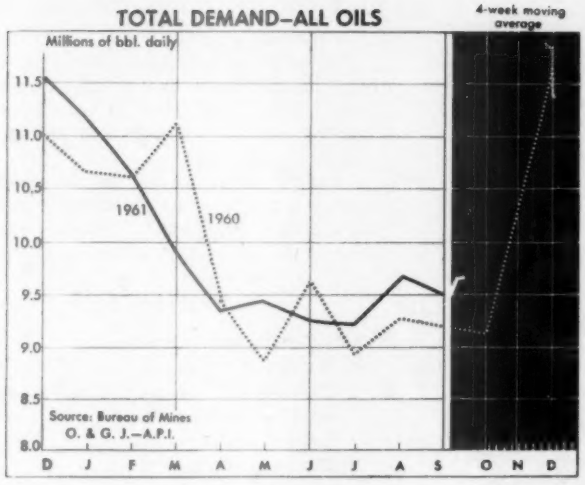
Daily average production for week

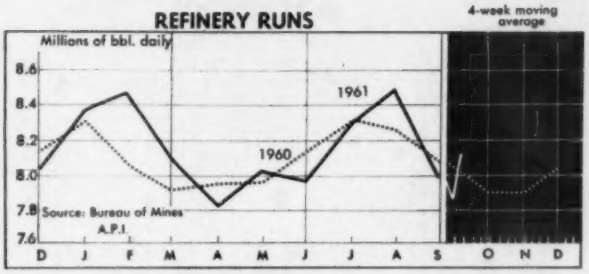
	October 14, 1961 Crude oil	Lease condensate	Total	Oct. 7 total
Alabama	16,900		16,900	16,800
Alaska	23,750		23,750	22,000
Arkansas	73,350	125	73,475	73,425
California	815,200		815,200	813,400
Colorado	127,800		127,800	127,300
Eastern	40,800		40,800	41,800
Florida	900		900	900
Illinois	226,900		226,900	215,500
Indiana	31,500		31,500	30,400
Kansas	†310,035		†310,035	†310,600
Kentucky	52,000		52,000	51,600
Louisiana	1,027,000	158,125	1,185,125	1,186,125
North	102,450	5,850	108,300	109,300
South	924,550	152,275	1,076,825	1,076,825
Michigan	52,500		52,500	52,500
Mississippi	146,000	4,100	150,100	150,100
Montana	88,600		88,600	87,800
Nebraska	71,600		71,600	72,500
Nevada	400		400	400
New Mexico	308,000	7,500	315,500	315,500
North Dakota	58,800		58,800	60,900
Oklahoma	†520,050		†520,050	†494,800
Texas	2,405,000	92,000	2,497,000	2,497,000
Dist. 1	43,000	2,800	45,800	45,800
Dist. 2	103,000	8,000	111,000	111,000
Dist. 3	305,000	38,000	343,000	343,000
Dist. 4	176,000	13,500	189,500	189,500
Dist. 5	26,000	700	26,700	26,700
Dist. 6	115,000	8,500	123,500	123,500
East Texas field	126,000		126,000	126,000
Dist. 7-B	125,000	450	125,450	125,450
Dist. 7-C	106,000	3,550	109,550	109,550
Dist. 8	980,000	12,000	992,000	992,000
Dist. 9	194,000	2,500	196,500	196,500
Dist. 10	106,000	2,000	108,000	108,000
Utah	93,100		93,100	92,400
Wyoming	407,900		407,900	408,700
Others	‡550		‡550	‡600
Total U. S.	6,898,635	261,850	**7,160,485**	7,123,050
Change from previous week, up			**37,435**	
Canada	†615,600	†18,000	†633,600	†594,000
Total U. S. prod.—Jan. 1-Oct. 14			2,063,234,950 bbl.	
Same period last year (crude plus cond.)			*2,021,031,600 bbl.	

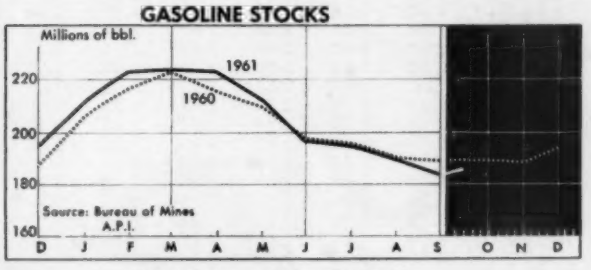
*Includes 64,941,600 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

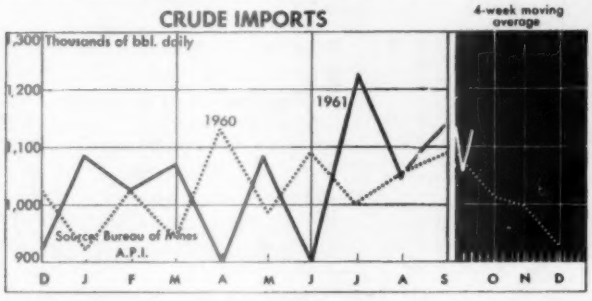
CRUDE-OIL PRODUCTION

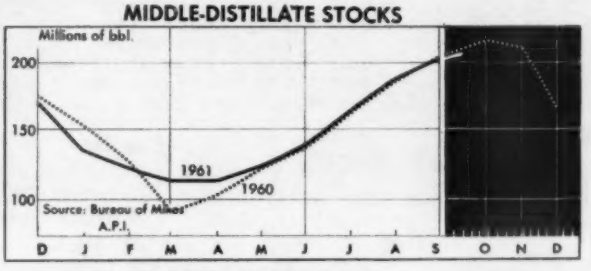


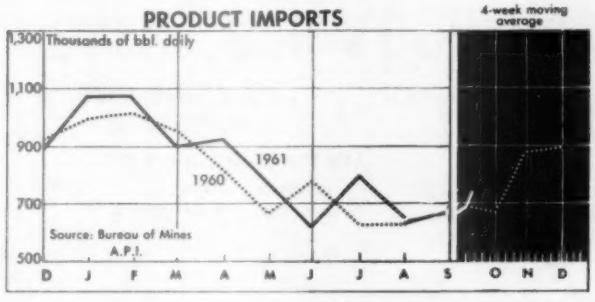


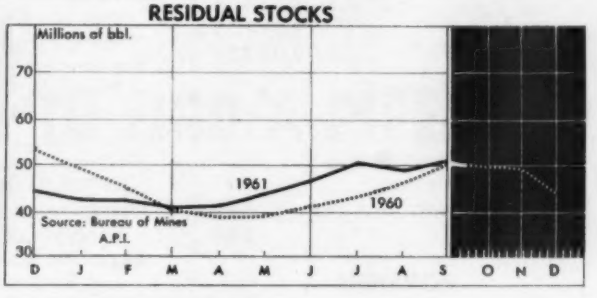












API refinery report—October 13, 1961

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1960—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,139	527.7	31.4	365.7	144.3	45,856	14,650	67,381	14,366	1,159	517.7	36.6	341.5	143.9
Appalachian:														
District 1	106	48.9	1.3	24.6	9.4	5,490	745	3,937	389	75	30.7	2.1	15.5	9.3
District 2	110	58.3	6.3	21.3	11.7	3,047	433	1,693	244	108	565	5.7	21.1	11.3
Ind., Ill., Ky.	1,480	784.4	90.2	302.4	153.2	31,352	7,386	31,290	5,882	1,420	725.4	77.9	311.4	156.6
Minn., Wis., Dak.	127	58.3	9.1	28.7	15.1	6,772	1,771	8,327	637	118	55.4	4.7	29.2	16.7
Okla., Kans., Mo.	639	363.1	22.4	148.0	22.7	17,174	1,862	12,938	1,067	674	375.2	8.8	169.4	20.0
Inland Texas	296	208.6	11.2	48.2	17.3	7,004	656	1,681	2,721	276	218.8	9.2	44.0	18.9
Texas Gulf Coast	1,987	969.0	125.4	500.9	113.1	21,622	3,496	16,709	5,052	1,864	972.9	124.1	473.3	128.3
La. Gulf Coast	729	363.9	62.6	183.2	39.9	10,415	1,751	6,804	1,254	674	340.5	76.0	135.6	47.2
N. La. and Ark.	121	68.6	5.1	29.1	5.0	6,390	804	2,524	196	110	66.6	6.1	21.7	5.6
Rocky Mountain:														
New Mexico	29	15.4	0.4	5.1	2.7	661	44	205	70	14	9.8	0.3	2.5	2.2
Other Rocky Mt.	293	124.4	9.3	54.7	32.7	5,266	704	2,692	1,185	284	136.8	2.9	65.4	29.2
West Coast	1,268	546.1	42.3	204.4	285.3	24,692	2,027	14,238	16,919	1,132	527.1	32.5	184.3	241.7
Oct. 13, 1961	8,324	4,136.7	417.0	1,916.3	852.4	185,741	36,329	170,419	49,982	7,908	4,033.4	386.9	1,814.9	830.9
Oct. 6, 1961	8,155	4,113.3	383.3	§1,915.6	789.0	185,110	36,265	166,438	50,080	.....	.....	.....	.....	.....
Oct. 14, 1960	7,898	4,074.0	408.1	1,694.7	819.7	188,159	35,987	175,066	51,427	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Rev.

Prices

CRUDE-OIL PRICES

Gravity schedule

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver-Julesburg	Wyo. (sour)
14-14.9	$1.86								
15-15.9	1.93								$1.81
16-16.9	2.00								1.86
17-17.9	2.06								1.91
18-18.9	2.13								1.96
19-19.9	2.20							★	2.01
20-20.9	2.27	$2.49	†$2.35	$2.61	$2.29	$2.95	$2.90	‡$2.38	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.40	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.42	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.44	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.46	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.48	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.50	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.52	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.54	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.56	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.58	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.60	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.62	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.64	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.66	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.68	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.70	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.72	2.89
38-38.9		3.01	2.89	2.97	2.97	3.31	3.26	2.74	2.91
39-39.9		3.03	2.92	2.99	2.99	3.33	3.28	2.76	2.93
40-44.9		3.05	2.95	3.01	3.01	3.35	3.30	2.78	2.95

*Cooke, Grayson, Montague. †Other posting starts at $2.55. ‡Some at $2.58.

FLAT PRICES

Louisiana:
- Sweet Lake $3.00

Texas:
- East Texas 3.10-3.25
- Conroe 3.23-3.53
- Van 2.93-3.08

Pennsylvania Grade:
- Bradford $4.80
- Middle District 4.52
- Southwest Pennsylvania 4.25
- West Virginia 4.17
- Buckeye Grade 4.08

Illinois Basin 3.00

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)
- Arabian, 34.0°-34.9°, Ras Tanura $1.80
- Iranian, 34.0°-34.9°, Bandar Mashur 1.78
- Iranian, 34.0°-34.9°, Abadan 1.73
- Iraq, 35.0°-35.9°, Fao
- Kuwait, 31.0°-31.9°, Mina-al-Ahmadi 1.59
- Qatar, 41°-41.9°, Umm said 1.95

Middle East, E. Mediterranean:
- Arabian, 34.0°-34.9°, Sidon $2.17
- Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli 2.19

Far East (cargoes, f.o.b. Lutong, Sarawak):
- Seria Light, 36° 2.42

Canada:
- Leduc-Woodbend $2.63
- Redwater (Alta.) 2.52
- Weyburn (light) 2.185
- Midale C 1.89

Venezuela:
- Cumarebo, 47°-47.9°, Tucupido 3.34
- San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
- Oficina, 35°-35.9°, Puerto La Cruz 2.80
- Tia Juana medium, 26°-26.9°, Amuay* 2.30
- Quiriquire, 16.0°-16.4°, Caripito 2.10
- Lagunillas heavy, flat, Las Piedras* 2.10
- Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Price for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long ton)

(Latest reported spot fixtures)
- ★ Gulf-NY, clean (ATRS—15%) $2.42
- ★ Gulf-NY, dirty (ATRS—7.5%) 2.64
- Carib.-NY, clean (ATRS—45%) 1.51
- ★ Carib.-NY, dirty (ATRS—50%) 1.38
- ★ PG-UK, dirty (Scale—57.5%) (26s. 7d.) 3.72

★ Denotes change from previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):
- ★ Regular (91 octane) .. 9.50-9.75
- ★ Premium (99 octane) . 12.25-12.50
- Natural gasoline (26-70) 4.5
- Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
- Regular (90 octane) .. 10.50-11.00
- Regular (92 octane) .. 10.75-11.25

California (rack) Los Angeles:
- Regular (90 octane) 11.20
- Premium (94 octane) 12.20
- Premium (100 octane) 13.35

Caribbean area (cargoes):
- Regular (87 octane) 9.00
- Premium (97 octane) 11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):
- Kerosine 42-44 ..... 9.50-9.75
- Diesel oil (58 d.i. and above) 9.00-9.25
- Distillate No. 1 ..... 9.00-9.25
- Distillate No. 2 ..... 8.25-8.50

Gulf Coast (cargoes):
- Kerosine 41-43 ..... 9.50
- Distillate No. 2 ..... 8.50

New York Harbor (barges):
- Kerosine 42-43 ..... 11.20
- Distillate No. 2 ..... 10.20
- Diesel fuel, 48-52 d.i. 10.35

Caribbean area (cargoes):
- Distillate No. 2 ..... 8.10

RESIDUAL FUEL

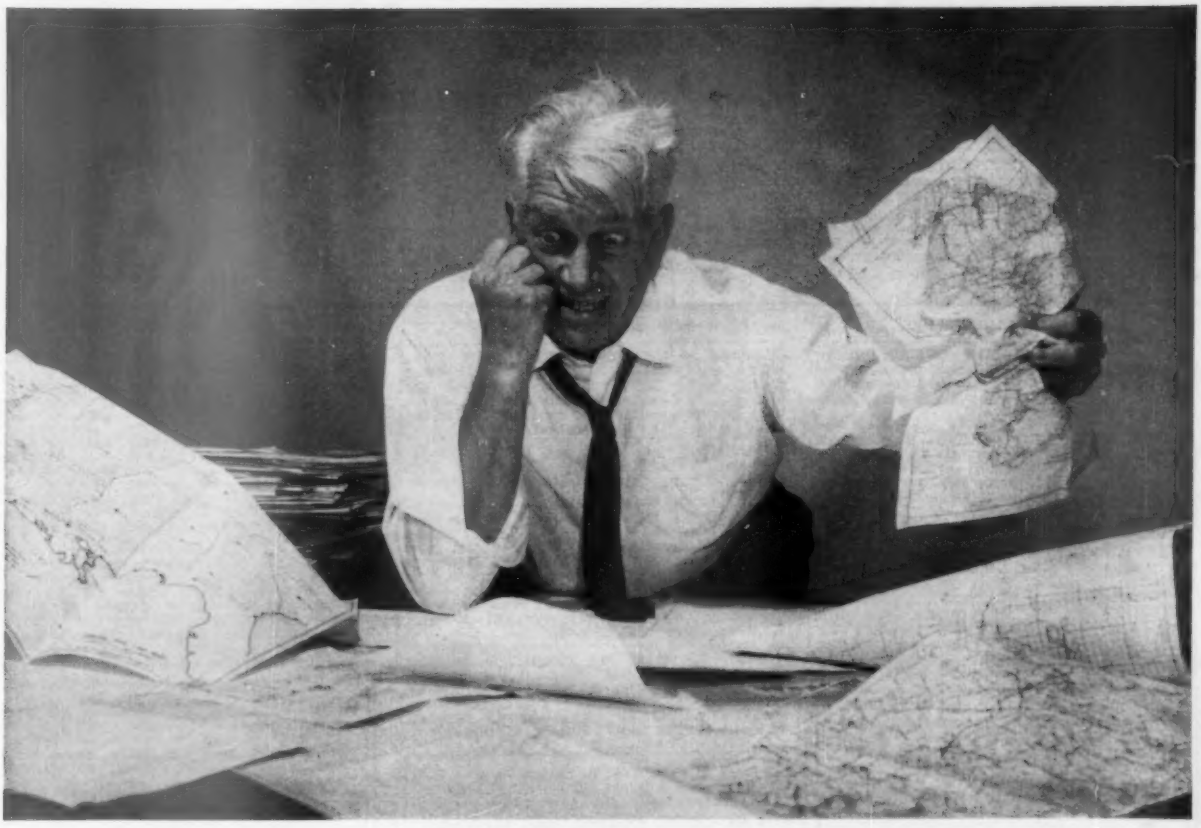
Mid-Continent (Group 3):
- Residual fuel (max. 1% S) $1.65-1.75

Gulf Coast (cargoes):
- ★ Bunker C fuel 2.30

New York Harbor (barges):
- Bunker C fuel 2.52

Caribbean (cargoes):
- Bunker C fuel 2.00

California (rack):
- Bunker C fuel, Los Angeles 2.25



EVER LOSE YOUR HEAD---
TRYING TO FIND A PIPELINE?

WHY GET LOST in a jungle of outdated and incomplete pipeline maps! You can find what you want at a glance by using the new wall-size map published by The Journal.

HIGHLY-TRAINED editors and artists did the sifting for you. They examined hundreds of small maps and documents to bring Journal readers a timely, one-piece map—showing crude and products lines in relation to refineries and LPG storage areas in the U. S. and Canada.

THE JOURNAL'S NEW pipeline map, 36" x 48", shows crude oil lines on one side and products lines on the reverse. Copies are available for $2.50 each from Reader Service Department, The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Oklahoma.

The OIL AND GAS JOURNAL

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. . . your market place for the oil and gas industry

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- **DISPLAYED CLASSIFIED** $20 a column inch one issue. 10% discount three or more consecutive issues. Minimum size one inch. Subject to agency commission.
- All classified payable in advance.

- **DEADLINE:** Copy to reach The Oil and Gas Journal not later than 9a.m on Wednesday preceding date of publication. Send advertisments to: Classified Advertising Manager, THE OIL AND GAS JOURNAL, P. O. Box 1260, Tulsa 1, Oklahoma

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WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona). Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone AXminister 2-0287. Copy deadline Monday noon.

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AN INVESTMENT! Productive advertising is an investment rather than an expenditure. Experienced oil men have found that The Oil and Gas Journal is their best classified advertising medium.

USED GAS PROCESSING Equipment: Glycol and Dry Dessicant Dehydrators; Quick-cycle Hydrocarbon Recovery Units; Water Flood Filter-pump Units. Also new oil and gas production equipment. Engineered Specialties Co., P. O. Box 35683. Phone FL 1-5284, Dallas 35, Texas.

SERVICE TRUCKS; Testing, temperature and pressure. Phone DA 1-2899, El Dorado, Kansas.

50,000 FT. 20 inch No. 1 grade used pipe. Lengths 20 ft. square cut ends. Weight 78# to the ft. High Tensile Pipe. Indiana-Ohio Pipe Co., P. O. Box 5462 Shep. Sta., Columbus 19, Ohio. Phone CL 3-5527—CL 3-5528.

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at ESSO REFINERY Balto., Md.

MOST EQUIPMENT NEW 1956

TOWERS—30" to 84" diameter, 20' to 97' high, 7 to 34 trays, up to 360 PSI

DRUMS—3' to 12' diameter, 12' to 45' long to 530 PSI, some lined—some NEW

PETRO-CHEM FURNACES—30.7; 19.3; 10.4; 9.7; 7.5 MM BTU/Hr.

NEW FURNACE TUBES—4000'—⅜" & ½" Wall Croloy 5—4" to 6"

PUMPS—88 to 400 GPM up to 2040' head—up to 8 Stage

HEAT EXCHANGERS—CONDENSERS

Stainless Tubes —235 to 2320 Sq. Ft.
Croloy 5 Tubes —573 to 1040 Sq. Ft.
Admiralty Tubes —216 to 1640 Sq. Ft.
Steel Tubes —238 to 2240 Sq. Ft.

COMPRESSORS & BLOWERS

7500CFM @ 42.5PSIG, 1250HP Synch.
129CFM @ 193PSIA Worth. HB 7½x9

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WRITE FOR CATALOG

HEAT & POWER CO., INC.

60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.
Boston & Haven St., Baltimore 24, Md.

FOR SALE EQUIPMENT

THREE SURFACE Combustion Corp., Special GFH-DX combustion generating units, 16,330 CFH, capacity, natural gas 2040 cu. ft./hour, air 20400 pressure 24-oz. with accessories. Alfred B. Kern, 305 Kennedy Bldg., Tulsa, Oklahoma.

FAILING 2500, 58' mast, 5 x 8 Pump. Howard Turner, Trailer Mounted. 1500 Failing. Fred Butler, Box 481, Pueblo, Colorado.

1—COOPER MODEL W Double Drum Unit Mounted on 1955 F-8 Ford. 1—Cooper Model W Single Drum Unit Mounted on 1954 Chevrolet. 1—Bucyrus Erie 22-W Spudder Mounted on 1955 Chevrolet. All rigs in first class condition. Financing can be arranged to a responsible person. Kent Well Servicing Company, Inc., Drawer 470, El Dorado, Kansas, Phone DA 1-9440

SELL OR trade for production, surplus equipment, anything of equal value. 4,000' Rotary, diesel powered, 7¼ x 14 pump, all miscellaneous equipment complete, ready for drilling. $25,000 cash or will finance. Milford Giffin, 580W, Chelsa, Oklahoma.

PECO GAS FILTER, Series 70, 5' x 10" horizontal vessel, .365" thick. Manufactured 1958. Like new, $500.

H-844 LEROI ENGINE, used very little, $2,500.

NATIONAL 1,000 LB. SEPARATOR. $900.

WANTED

5" x 11" INGERSOL-RAND ES-1 COMPRESSOR CYLINDER

5" x 11" WORTHINGTON HB COMPRESSOR CYLINDER

FRANK J. HALL
630 Giddens—Lane Bldg., Shreveport, Louisiana

FOR SALE

2 FLOATING STEEL CYLINDERS

250 FT. LONG, 28 FT. DIAMETER
FRUSTRUM SHAPED AT EACH END

Ideal for use in connection with offshore drilling rigs, storage, floating platforms, etc.

Located: Orange, Texas

UNION MINERALS & ALLOYS CORP.
45 Nassau Street New York 5, N. Y.

LIQUIDATION
Little Rock, Arkansas

11—28,000 gal. horiz. tanks, 11' x 38', dished, ASME 75 psi.

3—Worthington #LTC-4 air comp., 3,500 CFM, 24 x 15, 500 HP, nat. gas driven.

50—Heat exchangers, T316 Stainless, up to 2,000 sq. ft.

PERRY EQUIPMENT CORPORATION
1402 NORTH SIXTH STREET
Philadelphia 22, Pa., Phone POplar 3-3505

FOR SALE EQUIPMENT

1 OILWELL 66 Rotary with Lee C. Moore mast and 7500 ft. of 4½" drill pipe. Keta Gas & Oil Company. Box 250, Bradford, Penna.

FRACTIONATOR, REBOILERS, Condensers, Coolers, Exchangers, Dehydraters, Infilco Filters, BS & B Still and Contactor, National Dearator, Waukesha Engines, Marley Fans with gear reducers, Simplex and Centrifugal Pumps, Steam Turbine, and Regulation and Control Equipment. In service approximately 5 years. Direct inquiries to Box M-603, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE at bargain price—53 acres of minerals under 17N-23W and 23N-25W; 53 acres of surface only under 24N-25W and 24N-26W; 59 acres land owners royalty in 18N-25W all in Ellis County, Okla. Write: Marynel Chabino, Box 812, Oklahoma City or call CEntral 6-5405.

FOR SALE: Hydrostatic Testing Unit mounted on 1953 Chevrolet Truck, 1½ Ton.
UNIT CONSISTS OF: 2—McFarland Pumps—Model 6—5¼"—6B 1—Jacuzzi Pump—Model 15-FTZ-5. Powered by Wisconsin Engine, Model VH4D with 600 Gallon Water Tank and necessary valves, fittings, etc., to operate as a unit.
McADAMS PIPE & SUPPLY CO.
P. O. Drawer 285 Great Bend, Kansas
GL 3-9246

FOR SALE

Acidizing—fracturing—surplus equipment. Write Texas Transport Equipment Corp., Attention Clark Core, P. O. Box 47, Phone FR 9-5132, Seguin, Texas. Terms: cash—rent—lease-purchase to qualifying buyers. Equipment priced at 25 to 50% of acquisition cost.
Pump Trucks, Mack and International with triplex HP acid pumps sizes 3¾ x 5, 5 x 5, 4 x 8, 4½ x 8, includes tanks and HP connections.
Sand Proportioners, 4-wheel and float tandem, capacity 15-25 bbls. w/sand carrying and tank capacity.
Sand Transport, one Fruehauf 400 cwt tandem float.
Flush Tanks, 365 bbl. skid mounted.
Cameron Valves, HP 1000#, 3000-6000# pressure.
Sand Storage, 2—300,000# w/elevator & scales.
Paddle 4-Wheel Trailers, w/2000 gal. heavy tanks, Wisconsin power and Fairbanks-Morse centrifugal pumps and connections.
Radio 2-way, General Electric industrial system w/280' tower and 6 car sets.
Motors, Hall Scott marine, 650 HP, uses gas or gasoline.

USED EXPLORATORY RIG, COMPLETE!

GA-500-EMSCO 6,000 ft. plus capacity; Moore 126' mast, 9' substructure; 16" G-D pump; 2-LRT-6-1 Cummins Diesels; approx. 5,000 ft. 4½" drill string.

A MOST COMPLETE exploratory rig. All accessories, many extras; winterized; no additions needed, start drilling.

LOCATION: Near Craig, Colo.

PRICED TO SELL!

LUCEY PRODUCTS CORPORATION
624 South Cheyenne
Phone LUther 4-4711
Tulsa, Oklahoma

FOR SALE EQUIPMENT

1 P-23 WALKER-NEER double-drum unit with spudder attachment on 6 x 6 GMC all tools and ready. Bargain. J. C. Cantrell Box 1016, Ada. Oklahoma.

DELONG AIRJACKS for raising drilling platforms or drydocks, 72" I.D. New surplus condition, complete. 40 available. Our price $2,500.00 each. New cost $25,000.00 each. Phone—NE 3-8027, Marine Equipment Corporation, 3060 N. W. North River Drive, Miami, Florida.

2500 TRAILER MOUNTED Franks. Powered with 671 and 471 G.M. Diesels, 7x10 Wheatly pump, water pump, 1000' water line, approximately 3000', 3" or 4" drill pipe. Two Chevrolet trucks, ton and half, 300 electric welder, miscellaneous drilling tools complete with doghouse. All excellent condition. $14,500. Also, 2500 Franks Friction Clutch Drawworks, completely overhauled. $750.00. Milford Griffin, 580W, Chelsa, Oklahoma.

Sales—GAS COMPRESSORS—Rentals

Save 25% to 40% over new price
Used 30 h.p. to 300 h.p.—Guaranteed
New and Rebuilt Gas Engines
INDEPENDENT FIELD SERVICE, INC.
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Phone 425-3497

AT N. LITTLE ROCK, ARKANSAS

3—Worthington #LTC-4 compressors, 3500 CFM @ 45 PSI, 24 x 15, 2-cyl., 500 HP. 4-cycle. gas-engine drive.

Phone POplar 3-3585

PERRY EQUIPMENT CORP.
1402 N. Sixth St.
Philadelphia 22, Pa.

(6) 96,000 Bbl. 120'x48'
WELDED CONE ROOF
OIL STORAGE TANKS
INSTALLED NEW in 1952
Dismantled, Matchmarked For
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TANKS—WANTED

6—12'x10' 202 Bbl. and 8—10'x15' 210 Bbl.

No. 1 Used Welded Steel Stock Tanks. Give complete description, manufacturer's name and quote price present location also price delivered our property Gorham, Kansas. Contact H. D. Lawver, Home-Stake Production Company, 2302 Philtower Bldg., Phone LU 4-5281, Tulsa, Oklahoma.

HELP WANTED

WELL-SITE GEOLOGIST

Immediate opening. Age 30-35. Minimum five years concentrated sample examination experience in the Mid-Continent, Rocky Mountain or West Texas area. Free to relocate. First location in Nebraska. Salary commensurate with ability and experience. Send resume and recent photo to Hunt Oil Co., 700 Mercantile Bank Bldg., Dallas 1, Texas. Atten: Personnel Dept.

HELP WANTED

SENIOR PROCESS ENGINEER

Experience required in designing all types of refinery process units. Splendid opportunity to advance with engineering and construction firm having world-wide representation. All replies held in strict confidence. Address or call collect:

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West Coast refiner requires Laboratory Director to pursue research and development in field of asphalts and allied materials. Advanced degree & record of performance in similar capacity desirable. Challenging work for a man who has the ability to direct activities of ten man laboratory. Our employees know of this advertisement. Send detailed resume to

BOX 31 Q 281, THE OIL AND GAS JOURNAL
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REFINERY CHEMICAL ENGINEERS
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Desired for opportunities in a large modern refinery of the Lago Oil & Transport Company, Ltd., in Aruba, Netherlands Antilles, en afiliate of STANDARD OIL COMPANY (N.J.). Candidates must be graduate Chemical Engineers with 3 to 5 years refinery experience and a working knowledge of refinery processes for performance analysis, design and economic evaluation of the operation of a major refinery. Possibilities for later assignment to Economics and Programming Group. Liberal employee benefits including home vacations with travel allowances. Interviews will be arranged for qualified candidates. All replies confidential. Send complete resume of work experience and personal data to:

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New York 19, New York

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Career opportunity for chemist with minimum of 2-3 years experience in development of corrosion inhibitors for petroleum industry, either production or refining. Work in modern new laboratory for company that pioneered the Tretolite line of KONTOL Corrosion Inhibitors for the petroleum industry.

MS or PhD degree in Chemistry, Metallurgy, or Chemical Engineering. All replies held in strict confidence. Write to:

Director of Research

PETROLITE CORPORATION
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HELP WANTED

TRANSLATORS-ENGINEERS WANTED—Proven ability to translate technical material into fluent English essential. Attractive full time or free-lance arrangement. All languages of interest, particularly Russian & Japanese. Send resume to: A•T•S, Inc., Drawer 271, East Orange, N. J.

WANTED, by progressive independent producing company—Graduate Petroleum Engineer with a minimum of 8 years experience in drilling programs, well completions and workover recommendations. Furnish full history of experience. All replies will be treated confidentially. Box M-599, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs $5.00 cash OIML Co., Box 2803, Tulsa, Oklahoma.

INDEPENDENT OPERATOR requires experienced geologist with knowledge of Four-corners area. Submit resume giving background and qualifications to Box M-612 Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER—PRODUCTION SUPERINTENDENT, Petroleum Engineer or Geological Engineer having 7-10 years experience with 7 years secondary recovery experience in unitization, design and operation. Location: Illinois Basin. All replies will be considered confidential. Send complete resume' with salary requirements and available date of employment to: Box M-609 The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM CHEMIST

Young man with degree in petroleum or chemical engineering to understudy Company's Petroleum Specialist. Excellent opportunity for individual growth and development.

Duties will include supervision of quality control laboratory plus assisting in the area of field problems and research. Person selected must be willing to relocate in Illinois.

Competitive salary schedule and benefit plans. Send complete resume, stating salary requirements to Box M-606, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER

Company growth has created need for a graduate Mechanical Engineer for Products Pipe Line Co. in Los Angeles. Applicants should have 5 to 10 years pipe line industry experience, preferably in products. Please send complete resume including salary information to Box 31 Q 282, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Cal.

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SITUATIONS WANTED

PETROLEUM ENGINEER—36, married. Twelve years diversified experience including management, financial and policy. Prefer southwest. Top references and resume on request. Box M-596, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST, presently located in South America, 8 years interpretation, administration, wants position with medium-sized company, preferably in Europe (Lybia) or Australia. Box M-602, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST: M.S., 15 years experience in South Louisiana, Box M-608, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 41 M.A. 4½ years experience major California Company, 2½ years experience suosurface-development geologist in Brazil. Desires position with aggressive company or independent, foreign or domestic. Complete resume on request: Box M-604, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOLOGIST, Reflection, refraction, geophysical-geological coordination. 10 years diversified U. S., South American, Canadian experience. Box M-605, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED Gulf Coast Geologist with tangible and intangible sales experience seeks challenging sales position. Box B-611, The Oil & Gas Journal, Tulsa, Oklahoma.

EXPERIENCED landman with references will lease anywhere by the day, week, month or acre. Write box 439, Mount Carmel, Illinois.

ENGINEER, thirteen years diversified experience drilling, production, equipment, and reservoir, foreign and domestic. Age 37. BSME degree. Desires responsible position foreign or domestic. Box M-597, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

LOCAL LEASEMAN wants party interested in purchasing small and scattered $1. per acre leases in counties of Furnas, Harlan, Phelps and Gosper, Nebraska. Box M-600, The Oil and Gas Journal, Tulsa, Oklahoma.

BARTLESVILLE & PERU production on three sides of new well to start 4/8ths working interest for sale for $800.00 per 1/8th reply box 589, Independence, Kans.

ST. LOUIS GROUP with substantial production interested in purchasing primary and secondary oil reserves in Illinois, Indiana, Kentucky or West Virginia. Can handle properties of any size. All replies confidential and all material forwarded will be returned. Box M-575, The Oil and Gas Journal, Tulsa, Oklahoma.

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

HAVE 70,000 ACRES Southeast Georgia, 10 year leases on Gravity Surveys. Gas and oil seepages in area. Want partner to furnish truck-mounted rotary slim hole drill rig for test drilling five wells through Tusculoosa or 4,500 ft., or help financing drilling deal for interest in acreage or farmout. Will sell 10,000 acre block with good geology reasonable. Chance to win $250,000.00 reward from state. Open for any legal deal for immediate drilling. T. R. Davis, 601 Jackson Street, Vidalia, Georgia. Phone 3639.

FOR SALE Used Oil Field Supply business in Oklahoma City on S.E. 29th St. 20 years in existence. Good stock of equipment. Oklahoma Pipe & Supply OR 7-4444 JA 8-6518

OIL, Gas and mining exploration prospects in Saskatchewan, Canada, for year end tax dollar expenditure. For details, write Box M-607, The Oil and Gas Journal, Tulsa, Oklahoma.

$3,000,000.00 copper deposit recoverable by leaching (process similar to secondary recovery of oil by water flooding). Will assign half interest for $5,000. To install units; less if you have used pipe and water pumps. Write for engineering data.

Box 117, Encino, New Mexico.

EXPLORATION PROSPECTS WANTED

Individual desires up to 25% interest in prospects being drilled before December 15th. Submit only ventures based on sound geology. Prefer extensive acreage and large potential per well. Deal and offeror must stand rigid inspection. Reply to:

EDMUND OIL & GAS
Attention G. R. Stocker, Geologist
P. O. Box 99, Barrington, New Jersey
Telephone: Area Code 609, Lincoln 7-3230

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DELAWARE CORPORATION formed and serviced American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

PRODUCTION WANTED

WANTED: marginal or isolated production. Fast quotes, good prices. Contact Joe A. Huitt, 1506 Philtower, LU 7-3080, Tulsa, Oklahoma.

REAL ESTATE

SMALL CHICKEN Ranch in Ozark Lake Country. For Sale at Bargain. Call or write E. A. Morse, Lincoln, Ark. Ph. TA 4-2531.

ROYALTIES

ROYALTY BUYERS—Income producing gas-distillate royalty, new, deep, completed wells, Texas Gulf Coast. Tax benefits being 27½% of depletion allowance. Ogden Oil Company, P. O. Box 409, Taylor, Texas.

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NEW MEXICO, Valencia Co., 640 acres, T. 6N.—R2W, Sec. 22 Wyoming, Lincoln Co., 654 acres, T. 22N.—R. 11E W.—Lots in both Sec. 16 and Sec. 17.
Arizona, Apache Co., 640 acres, 1. 10N.—R. 28 E. Sec. 36. Box M-610, The Oil and Gas Journal, Tulsa, Oklahoma.

ARIZONA—Big "Helium" lease play. Leases Available near Majors $1.00 acre. Terms—Free Maps. Edward Colson, 1716 W. Devonshire, Phoenix, Arizona.

DO YOU HAVE A LEASE TO SELL? For as little as $5 per week you can tell your proposition to over 45,000 oil men through the Journal's classified advertising pages. You'll be surprised how many are interested.

READY TO DRILL direct offset well to Bartlesville Sand. Production three sides. Proven lease. Need three associates. S & M Drilling Production Co., Box 59, Cherryvale, Kansas.

FOR SALE: Up to ½ interest 40 acres offsetting new water flood. One well pumping, good investment for nice income, more good locations to drill. Montgomery County, Kansas. Bartlesville production 730 feet. Box M-593, The Oil and Gas Journal, Tulsa, Oklahoma.

HAVE LEASES IN N. & N. E. Ohio. 1 Block 3500 Acres, Clinton Production Assured, deeper production possible. Write: W. P. Hambleton, Box 522, Hartville, Ohio.

LIST OF 100 oil companies showing names of land-leasing managers and division land managers. $5.00 cash. Oil Industry Mailing List, 405 Tuloma Bldg., Tulsa, Okla.

FOR LEASE: Mineral rights; 3458 acres block 1. For sale: 357 acres block 2, Val Verde County, Texas. Brown-Bassett field, Payne, 2100 B. Kenwood, Austin, Texas.

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LEGAL

SEALED BIDS FOR oil and gas leases on allotted and tribal Indian lands in Payne, Noble, Pawnee and Kay Counties, Oklahoma, will be received until Thursday, November 16, 1961, at 2:00 p. m., C.S.T., at the Pawnee area field office, P. O. Box 97, Pawnee, Oklahoma. Leasing will be governed by regulations of the Secretary of the Interior.

(Continued from Page 200)

Kansas adds new discoveries

NEW oil and gas discoveries feature Kansas exploration. Barber County has a new Mississippian oil pool, Comanche County has new Mississippian gas, Ordovician gas is reported in a Pratt County wildcat, conglomerate oil was found in Reno County, Graham County has a new Lansing-Kansas City field, and Morrow gas was tapped in Clark County.

Barber discovery. Kenneth Rupp and Benedict Oil Associates 1 Robbins-Gallup unit is a new Mississippian oil pool 1½ miles east of Robbins Ranch field in northwestern Barber County.

The well, NE SW SW 18-31s-15w, 4½ miles southwest of Sun, swab tested 135 bbl. of oil in 9 hours, or 15 bbl. hourly. Perforations are at 4,706-27 ft.

Continental Oil Co. 1 C. F. Biddle, C NE NE 13-33s-17w, 4½ miles northeast of Beals field, Comanche County, flowed 3,930 M.c.f.d. during drill-stem test of the Mississippian at 4,993-5,038 ft. This strike is 10 miles southeast of Coldwater.

The same firm's 1 Brehm, Pratt County, SW SE SW 23-28s-13w, made 1,790 M.c.f.d. on drill-stem test at 4,220-67 ft. From Viola at 4,264-88 ft. the flow was 4,260 M.c.f.d. A test at 4,288-4,313 ft. made 5,500 M.c.f.d. The Simpson made 3,500 ft. of oil on drill-stem test at 4,387-4,403 ft. Flow from Lansing at 3,828-40 ft. was 2,310 M.c.f.d.

Mull Drilling Co., Inc. 1 Morgan, 7 miles west of Nickerson in C NE SW 17-22s-8w, 1½ miles southwest of Sterling field, pumped 141 bbl. of oil per day from conglomerate perforations at 3,544-54 ft.

C. G. Drilling Co. and Houston Petroleum Co. 1 Bell opens a new field in SE SE SE 4-10s-24w, 1 mile northeast of Bryan field and 11 miles southwest of Hill City. The discovery well of Northeast Bryan field made 145 bbl. of oil per day from perforations in the Lansing-Kansas City at 3,972-97 ft.

Clark County extension. Ashland Oil & Refining Co. extended Mc-

Kinney field 1½ miles southeast at 1 Theis, C NW SE 6-35s-25w. The Morrow well made 13,750 M.c.f.d. from perforations at 5,936-38 and 5,884-96 ft.

Ohio's Union Furnace pool continues move northwest

Additional Clinton successes in Washington Township, Hocking County, continue to move Union Furnace pool west and north.

Preston Oil Co. reported the first 24-hour test of 1 Paul Dean, after fracture was 158 bbl. oil per day. A ⅓-mile northward extension by O. D. Sharp 1 J. L. Foraker, Section 21, tested 92 bbl. oil per day after fracture. And, A. M. Carlson 2 A. N. Wilcox, Section 28, reported 125 bbl. oil per day.

In addition, seven more locations are presently drilling or testing in the area.

Wyoming multipay well taps Devonian

The multipay discovery in Wyoming's Elk Basin field swabbed oil from the Devonian at 115 bbl. in 4 hours. This significant well is Pan American Petroleum Corp.'s 189 Unit in Lot 5, 19-58n-99w, Park County, Big Horn basin.

Recovery was from five sets of perforations in the Jefferson Devonian at 5,308-5,510 ft. On earlier tests this deep test flowed 20 bbl. per hour from Big Horn Ordovician and pumped 65 bbl. of oil per day from the Flathead Cambrian.

Wasatch Tertiary discovery reported in Piceance Creek

Wasatch gas-condensate production is reported at a wildcat in Piceance Creek field, Rio Blanco County, northwestern Colorado. The well is Mobil Oil Co. 68-11 Unit in SW SE 11-2s-97w.

The well flowed 5,150 M.c.f.d. and 14.7 bbl. of condensate per day on ½-in. choke from perforations at 5,185-5,257 ft. Location is on the west side of the field, 1½ miles south of Green River gas production and 3 miles west of the major development in the field. The new well lies 3 miles northeast of Sulphur Creek field where Green River, Mesaverde, and Wasatch gas production is already established.

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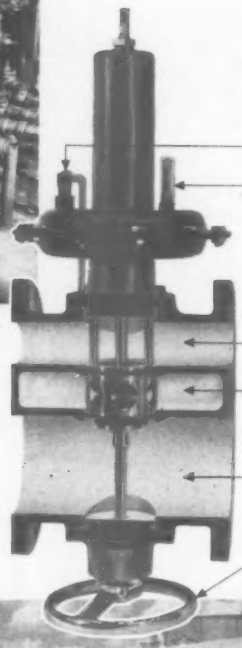
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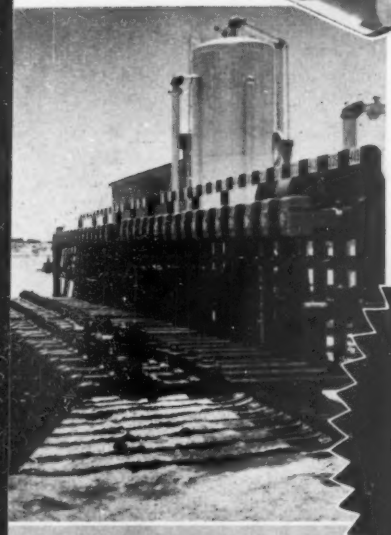

32 Model 8, 600 psi WP MANI-FLO Valves installed horizontally in West Texas. Electro-hydraulic topworks consists of a hydraulic pump driven by an electric motor which actuates the plug against the seat.

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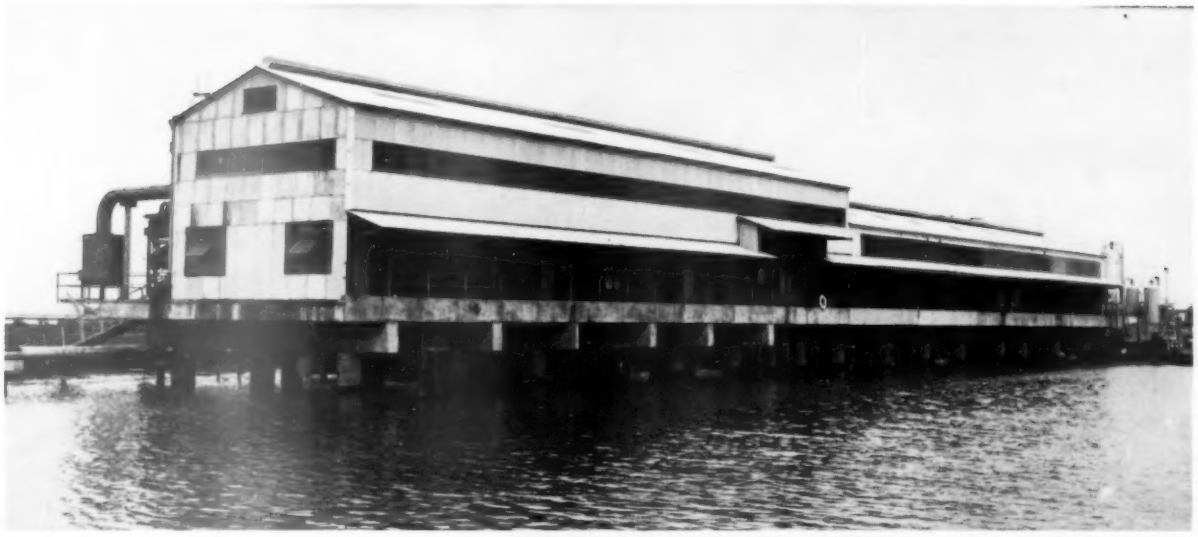

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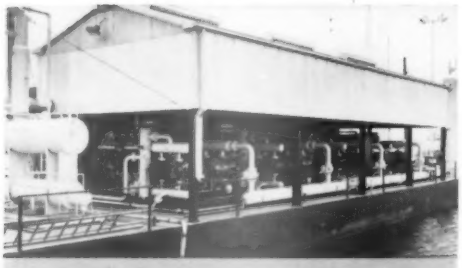
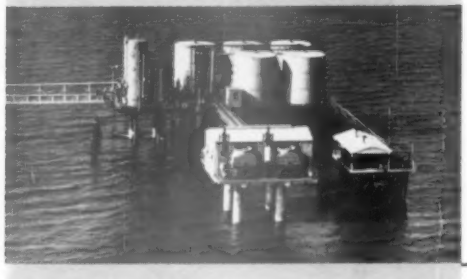


1600 HP Southwest Floating Compressor Barge at CATC's Grand Isle, Louisiana base.

Two 660 HP Southwest Packaged Compressors in Southern Natural Gas Company's remotely operated Olga Station near Quarantine Bay, Louisiana.



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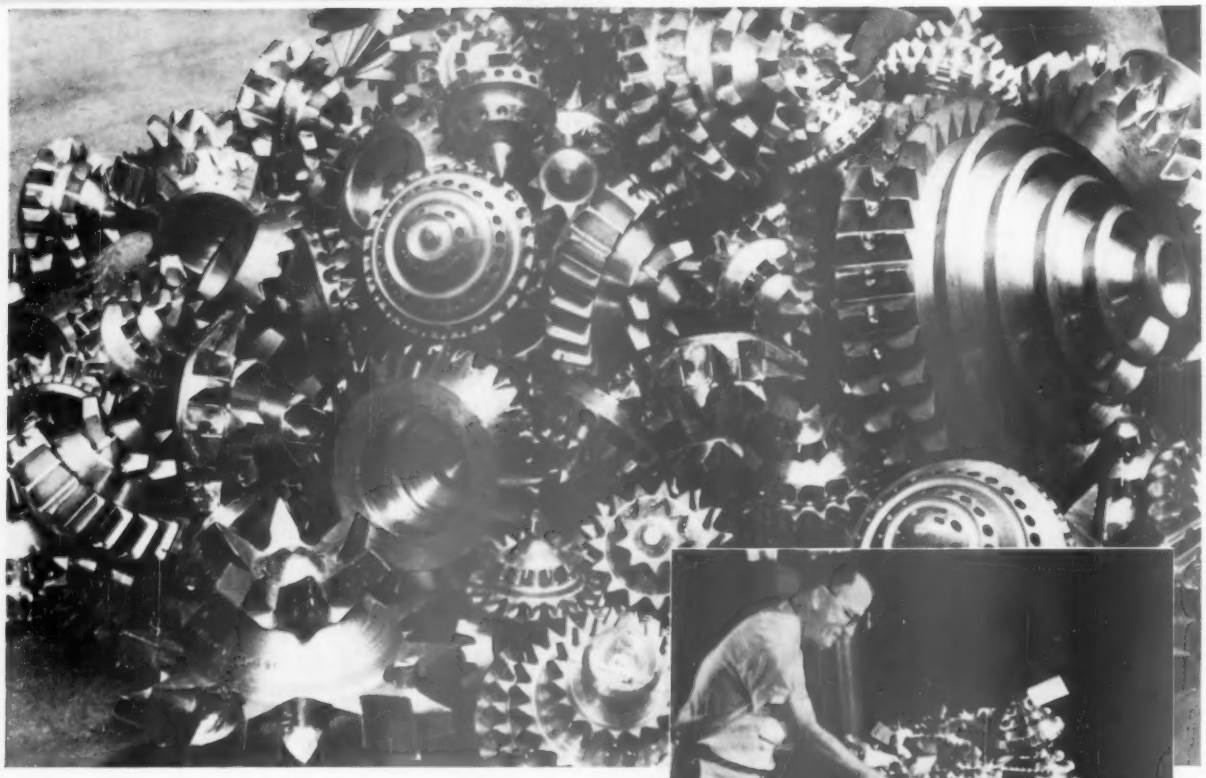

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